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THE INFLUENCE OF HEREDITY ON THE HEALTH OF THE FAMILY
Barton Childs, M.D.

HEREDITY COUNSELING
C. Nash Herndon, M.D.

PERSPECTIVES IN POPULATION EUGENICS
Gordon Allen, M.D.

PERCEIVED DIFFERENCES AMONG TWINS
Harold E. Jones

PSYCHIATRY AND MARITAL PROBLEMS: MENTAL HEALTH IMPLICATIONS
Emily Mudd

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Vol. 2, No. 2, June, 1955 **Eugenics Quarterly**

EDITORIAL COMMENT

Report on Annual Meeting

The 1955 meeting of the Society was held on April 22nd during the sessions of the Groves Conference on the Family, at the University of Pennsylvania. The meeting was marked by papers which covered a broad eugenic range, and they were subjected to competent scientific discussion.

The morning session was opened by Dr. Barton Childs of the Harriet Lane Clinic at Johns Hopkins, Baltimore. In an authoritative paper on hereditary factors in disease, Dr. Childs clearly showed the increasing interest of doctors in genetics. But all of his emphasis was put on the cure of hereditary diseases, and none on their prevention. If, as seems probable, the paper was representative of present-day medical thinking, it would appear that the medical profession has reached at least the first stage in accepting eugenics. They recognize the importance of heredity in a very great number of diseases, but they are not ready as yet to take any responsibility for reducing the incidence of the genes which are known to cause the diseases.

Dr. Stanley Gartler of the Institute for the Study of Human Variation at Columbia was a discussant. He pointed out that due to increasing advances in medical research new therapy is constantly being created for the hereditary diseases. We must accept at the same time as a result an increase in the incidence of these diseases. Since many of such diseases are chronic, heavy financial burdens are imposed on families and society. Psychological problems also arise for normal members of the family, and therapy is required not only for affected individuals but for relatives fearful of inheriting disease.

Dr. Gordon Allen of the Research Branch of the National Institute of Mental Health suggested broadening the concept of heredity and family health to include normal variations as well as medical variations. Family health is dependent not only on physical health but also upon the intelligence and emotional qualities of the parents, and with respect to these traits normal heredity is probably the marriage counselor's strongest ally.

The afternoon session was under the able chairmanship of Dr. Franz Kallmann. Dr. C. Nash Herndon gave a paper on Heredity Counseling, and Frederick Osborn spoke on the need for social and economic conditions under which the more responsible parents would have the larger proportion on children. These two papers gave rise to an active discussion.

Dr. Emily Mudd asked whether Mr. Osborn's proposals would not tend to increase the birth rate, and was that desirable. The reply was that in general the birth rate of couples at the educational level of high school or better was below replacement, while that of couples who had not gone through high school was substantially above the rate required for replacement. Our efforts at educational advance would be much more cumulative in their nature if this condition could be reversed. We don't know whether such a change would make for genetic improvement, but it could certainly do no harm. What was contemplated was an increase of some births and a decrease of others, without either increasing or decreasing births as a whole.

Mrs. Mudd then asked how the more responsible or better parents would be defined or picked out. The answer to this was that no one would try to define or pick out

the couples most desirable as parents. The idea is that it should be possible to develop social conditions under which couples who wanted children enough to assume the sacrifices involved would have more children than couples who were less willing to undertake such responsibilities. Some basis for this eugenic hypothesis is found in the way births are distributed among people all of whom have accepted and practice family planning. On a purely voluntary basis, perhaps almost unconsciously, parents who practice family planning effectively apparently tend to have children in proportion to their ability to give them proper care; those who are highly regarded by their neighbors having more children than those who are not so well thought of. More and better studies are needed before we can be at all certain that such a tendency is the rule. But the trend is hopeful and gives us a lead for finding other conditions in addition to family planning which will result in more of our children being born in homes which will best develop their capacities. Whether the results would also improve genetic qualities from one generation to another is still a matter of opinion; though it is hard to believe that people who make the best parents are on the average of inferior genetic stock.

Continuing the discussion, Robert Cook put forward a second eugenic hypothesis, namely, that when people have fully absorbed the eugenic point of view and when they have a better knowledge and more widespread understanding of heredity, there will be a natural tendency for those with the better heredity to have the larger families. Heredity counseling as described by Dr. Herndon would be an important educational part of such a process. It must be remembered that even a slight tendency along these lines would be enough. Natural selection has always been a hit-or-miss affair.

Professor Frank Lorimer cautioned against accepting either hypothesis until we have more factual evidence to support them. He questioned Osborn's use of the material from the Indianapolis study, feeling that the number of couples involved was too small, and that the birth rate of all of the groups practicing family planning was substantially below replacement. Using a number of charts, he illustrated the need for more studies, to learn more about the social conditions which affect size of family, and about the extent to which the capacities of parents are related to their genetic potential. But he felt that eugenics was moving in the right direction and that this type of discusion was valuable in pointing to the next things to be done.

General Charles A. Lindbergh who was to take part in the afternoon discussion, was unable to attend because of a sudden call to the West Coast.

The meeting was held jointly with the Marriage Council of Philadelphia and the Groves Conference on Marriage and the Family. There were about 150 people present at the afternoon session. The members of the Society were the guests of the Marriage Council of Philadelphia at lunch and had the privilege of hearing Dr. Mudd talk on the family-oriented society of Japan.

Minutes of Annual Business Meeting

The Annual Business Meeting of the American Eugenics Society was held at Houston Hall, University of Pennsylvania, Philadelphia, at 3:30 P.M. on April 22, 1955, immediately following the joint program of the Society and the Groves Conference on Marriage and the Family. The President, C. Nash Herndon, M.D., presided. The financial report for 1954 was presented. The following directors were elected through 1957: Ernest Burgess, Watson Davis, Lee R. Dice, Mrs. Shepard Krech, Gardner Murphy, Frank Notestein, Warren Thompson.

Plans for the 1956 Anual Meeting of the Society were discussed. The Society's policy of meeting with larger groups such as the Groves Conference was approved. It was suggested that the Eugenics Society explore the possibility of meeting with the

American Society of Human Genetics in 1956.

It was announced that the Eugenics Society has accepted an invitation to be a sponsor of the Ninth International Congress of Genetics to be held in Montreal, Canada in 1958. The Society voted to act as a sponsor of the First International Congress on Human Genetics to be held in Copenhagen in August 1956. A motion was passed to form a committee to contact Dr. Tage Kemp, organizer of the Conference, with Dr. C. Nash Herndon as representative of the Society.

A three-year grant of $12,000 from the Population Council, Inc. was announced.

Dr. Frank Lorimer, following up on his letter to the Editor in March 1955 EUGENICS QUARTERLY, suggested that research be carried out on larger aspects of eugenics such as (1) What are the kinds of things we need to know? (2) What influences people to have babies? (3) What new creative approaches can be developed?

The meeting was adjourned at 4:15 P.M.

Respectfully submitted,

FREDERICK OSBORN
Secretary

HEALTH AND THE FAMILY

Annual Meeting, American Eugenics Society, April 22, 1955
Held in Philadelphia, Penn. in conjunction with the
Annual Groves Conference on Marriage and the Family

Research Session

I. THE INFLUENCE OF HEREDITY ON THE HEALTH OF THE FAMILY

Chairman: Frederick Osborn

Discussants: Gordon Allen, M.D.; Stanley Gartler

General Session

II. THE MAKE-UP OF THE HEALTHY FAMILY

III. HEREDITY COUNSELING

Chairman: Franz J. Kallmann, M.D.

Discussants: Robert C. Cook, Frank Lorimer, Emily Mudd

I. THE INFLUENCE OF HEREDITY ON THE HEALTH OF THE FAMILY

BARTON CHILDS, M.D.
Department of Pediatrics
The Johns Hopkins Medical School and
The Johns Hopkins Hospital

IN A TIME WHEN medicine has become so diversified that ever-increasing specialization of personnel is occurring, many medical educators are emphasizing the importance of generalization. In some medical schools emphasis is being given to integration of patient material into teaching of the preclinical sciences so as to cause the student to see the importance of physiology, anatomy and biochemistry in disease. In addition the importance of the relationship of the patient and his disease to the health and welfare of his family and the community is being stressed, so that the student may see the impact of disease upon, not only the physical and emotional health, but also the social and economic health of individuals and groups of individuals. In some schools, students are assigned to one or more families, very early in their career, and are thenceforth responsible, under guidance, for the health of such families. In this way the student sees the many factors which are compounded to make for health or disease, and the relationship of these factors in the patient or potential patient to his environment.

Not least among such components is the genetic constitution with which the individual confronts his environment, and much of the variation in the clinical picture of a particular disease is certainly due to the constitutional background upon which the pathological changes are superimposed. These inherited qualities are in part shared by the members of a family, so that patterns of behavior in health and disease are more likely to be similar within

families than between unrelated individuals. Yet because of the particulate nature of the inherited genes, variation within families can still be large, and one may find widely divergent characteristics among brothers and sisters. Thus the medical student in studying the health of his families will see certain similarities in characteristics within each family as well as dissimilarities, many of which are inherited, though variable through modification by age and the special experiences of the individual, as well as by other inherited traits. An important part of the problem posed the medical student then, and indeed every doctor whether specialist or general practitioner, is the assessment of the expression of heritable capacities of the members of a family in the environment in which they live. This is not always simple, since we know so little about the mode of action of genes or the influence of the environment on their expression. In many instances we do not know the mode of inheritance of particular traits, or how many genes may be involved. But the expression of genes is not unmodifiable and an expansion of our knowledge of human genetics can lead to therapy where appropriate, and more importantly to prevention which is certainly the goal of medicine.

We do not know with much precision the way in which genes operate to control the balance of physiological and chemical mechanisms which we call health. A great deal of research has been devoted to the study of the nature of gene action, and it appears that what genes do is to control biochemical functions. Each step in the synthesis or breakdown of chemical substances or in those processes involving utilization or conservation of energy is mediated by one or more enzyme catalysts. There is a very close relationship between genes and enzymes, and particular genes appear to control in some way the functions of particular enzymes. Thus the genetic constitution exerts an ultimate control over the growth, development, integration, and adaptation of the individual through its influence on the chemical structure and function of the body, and this influence is operative at conception and ceases only with death. All the genes in the population which control a particular function are not identical, and some must differ slightly in that function in a quantitative way though not qualitatively, so that it is probable that more than one, possibly many, variants exist of each gene. Because of the nature of chromosomal inheritance no individual may hold more than two genes for a particular function, but if there are several variants or alleles, a number of pair combinations may exist in different persons. Various combinations of alleles are part of the reason why individuals differ one from another. An additional cause of variation is found in the fact that genes in other parts of the same or other chromosomes have effects which may modify the expression of a particular gene. Finally the external environment may modify in various ways the expression of gene action. Indeed we know of biochemical systems under genic control which are activated only in certain environmental states. Such systems might easily never be called into play; yet the potential exists and is inherited.

Given a large body of knowledge about the sources of variation, based mostly on investigations of animals, insects, plants, and micro-organisms, the question might reasonably be asked, why do we know so little about the genetic origin of human variation? We cannot do breeding or other experiments on humans, and so are left with the technique of observation of characteristics which can be detected and measured. This is most easily done with characteristics which present sharp discontinuities. That is, the individual either has the characteristic or he does not, and we can then separate people into discrete classes. We can do this in the case of blood groups, where an individual has red blood cells which contain on their surfaces certain

specific antigens whose appearance is due to single gene effects. The presence or absence of these blood-group substances is not modifiable by the environment, and the variation between individuals can always be assigned to the presence or absence in their genotypes of specific genes. Unfortunately, the bulk of non-pathological human variation is not so simple. When we come to measure normal morphological and physiological variation, we usually find a quantitative spectrum. That is, the variation is due to numbers of genes, each exerting its specific effect, and producing a characteristic which is the result of the cumulative effects of such genes, and which is what we observe and measure. There is no question, for instance, that stature and intelligence are in large part genetically determined, but so many are the components and so complex the mechanisms which make up the final, measurable characteristic that one is at a loss to separate and discover the single gene effects which must play a part. In general, therefore, we may say that the more immediate the measurable effect to the action of the gene, the more likely we are to be able to detect its association with the gene and to determine its mode of action and to be able to characterize its mode of inheritance, and in addition the less likely is the effect to be subject to modification by external influences. All this is not to say that we shall never know much about the inheritance of non-pathological characteristics. If one assumes that each gene has an effect, as methods of measurement become more refined it may be possible to detect and characterize their functions.

It is in disease states that we have a better chance to observe gene action, since affected individuals are so obviously different from normals. Here we are much more likely to be able to observe and measure some characteristic of a chemical nature which is closely related to the fundamental gene action. In such cases we are measuring the action of altered or mutant genes, and we usually find that the effects of such genes is not the creation of something new but the failure to perform adequately some chemical process. For instance, hemophilia is well recognized as a genetically determined disease. In hemophiliacs, the abnormal gene has not performed a new process but has failed in its normal function of producing a protein substance which is an important component of the blood-clotting mechanism. It is through the study of such pathological states that light is thrown on normal mechanisms, and through the study of mutant genes that we learn of the functions of normal ones.

It might be of interest at this point to examine some diseases in whose pathogenesis the inherited constitution plays a part to see the interrelationships of inherited capacities and the environment in family health.

Let us first consider rheumatic fever, a condition which looms large these days as a cause of morbidity and death in young people. It is clear that more than one member of a family is often affected, suggesting some heritable factor. Principal among studies suggesting this are those of Wilson and her associates (1954). They were able to study the incidence of the disease among offspring and other relatives of patients followed in their cardiac clinic over a period of many years. Assuming that an affected individual receives from each parent a single gene predisposing to the disease, they calculated the expectation of rheumatics in families in which one or both parents were affected, one or both parents had affected relatives, or one or neither had any history of the disease in the family. These expected numbers agreed rather well with the numbers of rheumatic patients observed, suggesting that a single gene substitution was responsible, and that the affected person carried two such genes. Other workers have not found the problem so straightforward and have had to say only that there is a strong hereditary pre-

disposition (Stevenson and Cheeseman, 1953). We do not know the precise nature of this predisposing factor, but it is important to think of it as susceptibility since we know that whether or not a person develops the disease depends in part upon his environment. Certainly the relationship of streptococcal infections to rheumatic fever is very clear, and we know that the condition is not common in warm dry climates. It is also less common in persons living in homes with adequate sanitation and space and where good nutrition prevails. Thus genetic susceptibles undoubtedly escape because of control of the environment. The usefulness of this knowledge in medicine is clear. The presence in the family of an affected individual suggests that other members may be susceptible, and such a family is then marked for special attention. Initial attacks of rheumatic fever can be prevented by immediate and sustained treatment of streptococcal infections with penicillin. In addition very early treatment of active rheumatic fever and prophylactic use of antibiotics to prevent recurrent attacks will enable the patient to avoid the permanent damage to the heart which leads to disability and death. Finally measures could be taken to improve the living conditions of susceptible families. Thus by control of the environment, the ravages of a disease to which some members of families are innately predisposed may be avoided. The next important step is to learn the precise nature of the predisposition. If this were known, susceptible individuals could be found without reference to an affected relative.

Rheumatic fever follows steroptococcal infections, but relatively few individuals who suffer such infections develop rheumatic fever. Doubtless this is a reflection of susceptibility or lack thereof to the disease. On the other hand people vary in their resistance or susceptibility to streptococcal or other infections. This is in part due to housing, sanitation, nutrition or other features of environment, as well as the virulence or avirulence of the organisms involved, itself a genetic factor, but of the invader not the host. In part, the resistance or susceptibility may be due to the function of a number of mechanisms present in the body to combat infection. Genetic control of variations in these mechanisms of resistance and immunity is very difficult to establish, but animal experimentation implies very strongly that it exists. Animals have been infected with various organisms and the survivors bred (Gowan 1952, Webster 1937). By continuous inbreeding of survivors for many generations, strains of animals have been produced which are 95 per cent resistant. These strains are resistant only to the organisms originally used and others closely related but not to organisms taxonomically distant. This suggests what one might expect; that very many genes are involved in the control of what we label broadly as resistance, and that each one has a specific function, mediating the response to specific stimuli.

As if to contradict this thesis, an interesting condition has recently been described among humans in which the normal mechanisms for the production of all antibodies against bacterial and viral antigens is absent. Such individuals suffer repeated and often intractable infections with a variety of bacteria and viruses (Bruton 1952, Janeway, Apt and Gitlin 1953). The blood proteins of these individuals have been found to lack the gamma globulin fraction, the fraction wherein most antibodies are found. There is evidence that the periodic administration of gamma globulin is helpful, as is the use of antibiotics. Other mechanisms of resistance are intact. The number of cases reported is small, but one clinically homogeneous group consists of boys only, and sometimes more than one per family, suggesting that the defect is due to a single gene, possibly sex-linked. If this is in fact a genetic entity, we appear to have a single gene which controls the production of most if not all antibodies. On the other hand the animal work just cited

indicates many genes involved in specific resistance to specific organisms.

A mechanism of resistance of viral infections which is genetically controlled has been reported by Sabin (1954). A strain of mice was found to be resistant to a particular strain of yellow fever virus and a few allied viruses. This resistance was achieved through the ability of the host to depress the multiplication of the viruses within the cells, and this ability is a property of the cells themselves, and not due to the production of antibody or any other of the usual mechanisms. It is interesting that the effect did not obtain when the mice were exposed to viruses other than that of yellow fever and a few related ones. About the nature of genic control of resistance to viruses in humans we know very little. Observations have been made, however, which do suggest familial susceptibility to poliomyelitis (Herndon and Jennings 1951).

The health of the entire family is affected by the degree of susceptibility or resistance of its members. The careful physician who knows the family well will take this matter into account and undertake measures of prophylaxis or prevention of infection accordingly. Here again, since we do not know the precise chemical or immunologic nature of variations in resistance, our efforts are directed primarily toward control of the environment. Even here we are met by obstacles in the form of hereditary variations in the microorganisms which cause infections. It is well known that mutant strains of many bacterial organisms exist which are resistant to the effects of antibiotics. Ordinarily these are but a small fraction of a population of organisms. But when the susceptibles are destroyed by the antiobiotic, the mutant resistant bacteria increase freely. Fortunately we can usually switch the treatment to another drug to which the mutant is sensitive.

We read a great deal in the popular press and elsewhere about the cause and effect relationship of the stresses of living in these times and high blood pressure. It is interesting to observe that here too there is a constitutional factor which appears to dispose certain individuals to the development of hypertension and coronary artery disease. Elevation in blood pressure is not itself a disease, but is a sign of disease, and one must first distinguish that which can be assigned to certain well-defined causes and that in which the cause is ill defined and which is therefore called essential hypertension. It is in this latter group that familial aggregations of hypertensives are found. It is not surprising that we do not know the precise genetic basis for essential hypertension. This is certainly a condition in which the inter-relationships of genetic, metabolic, and psychologic factors make the task of elucidating the role of each very difficult. Perhaps the best way to study this disease is to determine the characteristics of people who may one day become hypertensive. This is the approach taken by Thomas and her associates, (1951, 1952), who are studying certain physiologic, metabolic, and psychological functions of medical students at the Johns Hopkins University Medical School. Measurements are made of functions referable to the heart and vascular system under resting conditions and after various stimuli. This information is then reviewed in the light of the presence or lack of hypertension in parents and grandparents. It is apparent in these studies that circulatory lability is more often found in students who are the offspring of hypertensives than in those whose parents have normal blood pressure. Studies are also being carried out to assess the psychological make-up and adaptibility of the students, and these have shown differences between subjects with positive family history and those with negative history of parental hypertension or coronary artery disease. Many other characteristics show similar correlations, and the problem of the extent of participation of genetic factors as opposed to

environmentally conditioned similarities in behavior patterns (which in themselves doubtless have a genetic component), is a very difficult one to resolve. Still, if potential hypertensives or potential victims of coronary occlusion can be ascertained by the family patterns, much can be done to contribute to a more healthy future for such persons. An interesting study on hypertension has been made by physicians employed by the Du Pont Company (D'Alonzo, Fleming and Gehrman, 1955). They found an increased incidence of hypertension among employees who had one or two hypertensive parents. They regard this as significant and of value in job placement or assessment of future physical capacity of employees, and such information will help to direct their efforts toward modification or prevention of disease. Hypertension and coronary artery disease are conditions of middle age primarily, and disability or loss of the family breadwinner or mother are serious blows to the health and welfare of a family unit, quite apart from the suffering and disability of susceptible persons within the family.

There are many other pathological states in humans in which there appears to be a genetic contribution, but in which our methods of measurement are not sufficiently refined to assign the extent or even quality of that contribution. A good example of this is obesity. Obesity is perhaps not a disease, but it may be considered in many cases to be pathological. Obese persons do not live so long as normal weight or lean individuals, and there is a strong positive correlation with hypertension and coronary artery disease. It is certainly the experience of everyone to know families in which obesity is a characteristic feature. In this sense it is certainly familial, and doubtless there is some constitutional element in it. But all obesity is not due to the same cause. It is due to a caloric intake which is in excess of the energy and growth requirements of the individual. This may result equally from overeating, or from a relatively small caloric intake in a sedentary individual. Overeating may be habitual because of lifelong exposure to an abundance of food, or may in some, provide a form of satisfaction which is a substitute for other gratifications denied the individual. Sedentary habits may be due to illness or disability which prevent much muscular activity, or to conditions of temperament or psychological adaptation. Conversely, of course, leanness may appear in highly active or tense, overanxious people, who but for this could be obese. Many studies attempting to sort out these factors and show a genetic propensity for obesity have been done. (For reviews of the subject see Mayer, 1953, and Childs, 1954). These have shown a greater likelihood of obesity in parents, sibs, and offspring of obese persons than persons of normal weight. Twin studies of Newman and associates and of Von Verschuer have shown high correlation coefficients for identical twins, while those of fraternal twins and sibs were lower and about equal. Identical twin pairs reared separately showed coefficients which were lower than those reared together, yet higher than those of fraternal twins and sibs. These data do indicate a genetic factor but leave us in the dark as to mechanisms, and in particular families the physician often finds it difficult to know the extent to which habit, lack of exercise, temperament, psychological adjustment or the genotype is responsible, or the interrelationships of any or all of the above. What we need to find are physiological or biochemical patterns typical of the various kinds of obesity which can be studied in families. This is being done in animal genetics. Mayer has studied an example of obesity in mice who show a fundamental alteration of carbohydrate metabolism, and which appropriate breeding experiments have shown to be due to a single gene inherited as a Mendelian recessive. These mice are very inactive, but when forced to exercise they lose weight rapidly, but gain again when allowed to be inactive. But if

a gene causing mice to indulge in a peculiar "waltzing" behavior is introduced into the genotype of the hereditarily obese mice, they are no longer obese, due to their increased activity. These experiments illustrate the action of the environment on genetically determined characteristics, and the interaction of genes within the genotype, and highlight the unsolved problems in human obesity where we have much less information and are not free to perform experiments at will.

So far I have said nothing about defects which may be directly traceable to single gene substitutions and their impact on family health. In this area we are confronted with more discrete, sharply discontinuous characteristics whose apparent genetic determination may be more clearly seen. In some of these conditions we are able to track down the basic biochemical aberration and substitution therapy may be suggested. This is to say that the effects of the gene are more closely related to the observable and measurable characteristic in the individual than in the conditions previously discussed, and some at least of such effects are less modifiable by exogenous influences as well as by other genes in the genotype. Such defects are doubtless very numerous and involve every chemical and morphological system in the body. One might predict that whenever an enzyme presides over a chemical process there is a potential source of inborn error. Many would doubtless be lethal, perhaps during embryonic life and thus resist discovery, but new ones are being described all the time, and an ever-increasing amount of research is being devoted to the detection and elucidation of such diseases.

Some of the morphological defects are amenable to definitive surgical treatment, but many genetically determined conditions are errors for which, if any treatment is available, some form of substitution therapy is required. In this sense the patient never outlives his disease and must consider it in all aspects of life. In others no treatment is available, and in still others, though treatment may help, some damage may have been done which cannot be repaired. Thus in varying degree, patients with many of the hereditary diseases have problems which, during childhood at least, must be solved by the responsible members of the family. In addition, once parents are shown to be carriers of deleterious genes, there is the problem of risk of subsequent pregnancies producing additional defective offspring. Thus such families must accept burdens which other families do not have. Such problems are often a financial drain, requiring considerable outlays for hospitalization, medications and physicians. There are difficulties too in rearing children who are not perfectly healthy, and this may strain the emotional and intellectual resources of the members of the family. In this sense, then, the healthy outlook and prospects of the whole family may be taxed.

There are, for example, a number of genetically determined conditions resulting in mental defect, often severe. Institutional facilities are inadequate to care for all such children and the family must find ways to care for them. This problem often creates difficulties in the home. It is a serious blow to parental pride, and defective children do not always find the acceptance that healthy ones do. One often finds obscure feelings of guilt in the parents, and sometimes there is discord over the methods to be used to care for the child. In addition a retarded child certainly requires more attention than a normal one, and in some instances the healthy children are neglected in favor of the retarded one, and, as brothers and sisters grow older, the presence of a defective child in the home may prove a source of embarassment to them. Finally looming over all is the threat that subsequent children may be equally affected. This in itself may create a special problem since sometimes one parent is anxious to accept the risk and the other hangs back. In these ways is the well-being and unity

of a family strained when faced with a retarded or defective child. Much patience, tact, and acceptance are required of each member, and not all families are equal to the task.

Other types of defect pose similar as well as diverse problems. We have had the opportunity to follow for a number of years a family in which among seven sibs are four boys who suffer from an unusual form of diabetes insipidus for which there is no treatment. The defect in this disease is one of nearly complete lack of ability to concentrate solid waste materials in the urine. The urine is therefore very dilute, which means a very large volume is excreted. This in turn requires a very large intake of water, a need which is so vital that deprivation for more than several hours may result in collapse and death. For example, as infants these children required about one pint of fluid per pound of body weight per day, and those who survived, now at ages 10 and 12 years, ingest about two gallons each per day. This family is made up of two unaffected girls, one unaffected boy, and four affected boys, of which only two now survive. The fact that only boys are affected in this and other families suggests that the presumed gene is inherited as a sex-linked recessive, though we have recently found a family of two affected boys in which the mother also has the disease. Both boys are small for their age, and both are somewhat slow mentally and rather overactive, though they are pleasant and appealing children. They have lived with constant thirst, which as infants had to be satisfied by feedings every hour or two, day and night. This need had to be attended to, until the children could serve themselves, by the mother, to whom fatigue was a constant companion. As the children grew older each minor illness or respiratory infection, which in a normal child might be treated with an aspirin tablet and a day in bed, became a serious threat, often requiring hospitalization, with its attendant financial losses. Play and school are constantly interrupted by thirst and the need to void, and neither child has ever slept for eight consecutive hours in his life. Partly because of the problems created by these children the mother has been left by three husbands, but has found a satisfactory solution to her needs in a fourth, who is a good provider and fond of the boys.

This illness has been disastrous for two children in this family, has seriously reduced the potentialities of two more, and made a normal, healthy family life impossible. Other families might cope with the problem more constructively, or had the disease been milder less dislocation would have resulted, but as in all such conditions, the real answer is some form of treatment.

Another condition which exhibits some interesting features from the genetic point of view is virilizing adrenal hyperplasia. In this condition there is a partial block in the synthesis by the adrenal gland of compound F, a substance with important metabolic functions which are essential for life. In order to induce secretion of amounts of this hormone needed to maintain the body in efficient balance, the pituitary gland, which exerts quantitative control over the secretions of the adrenal, overstimulates the latter. This brings about a material increase in the size of the adrenal glands, and the release into the blood of large amounts of male sex hormones which these glands normally secrete in small quantity (Wilkins 1952). The effect of this is very rapid somatic growth and virilization. Children of a few years of age appear several years older and show development of secondary sex characteristics very early in life. The disease occurs in both males and females, and masculinization occurs equally in the latter with masculine distribution of body hair necessitating shaving and even, in older women, baldness. In such individuals, all female sex characteristics are suppressed. In 1950 it was discovered by Wilkins that

cortisone could be administered to substitute for the natural adrenal hormone, thereby reducing the pituitary stimulation and therefore the oversecretion of masculinizing hormone. Under treatment growth slows down to normal rates and virilization is prevented. In older girls and adult women, female sex characteristics then appear.

The disease often appears in more than one sib, though not in related individuals of different generations. We were recently able to study the genetics of this condition in 76 individuals from 56 families, all patients from the endocrine clinic of Dr. Lawson Wilkins. The evidence suggests very strongly that it is due to a single gene substitution, manifesting as a Mendelian recessive. The disease is, therefore, another genetically determined inborn error of metabolism, and the problems posed in the family are similar to those created by other genetic aberrations.

There is another aspect of this disease of important biological and cultural significance, and one which raises difficult questions for the family. Since the condition is an inborn metabolic error, evidences of it are often present at birth. In girls, the most conspicuous evidence of the disease is in the external genitalia. These organs look ambiguous so that one cannot be sure whether the baby is a boy or a girl, though the internal sexual organs are entirely female. Some such girls have been mistaken for males and have been raised as boys, a role in life which in many cases they have assumed with ease and without question. Some have functioned as males all their lives and have been as virile and masculine in their orientation as any male. Others have been raised as girls, though with masculine body build and hair, and masculine-appearing genitalia. In these latter cases psychological orientation is feminine, though such individuals are often deeply confused by their own masculine appearance. The psychological aspects of this disease and others which show anatomical contradictions of the genetic sex have been extensively studied by Money, Hampson and Hampson (1955). They have found that the gender role which a child establishes depends upon the orientation given the child by his family and the world at large, and upon the child's own observations of anatomical differences between the two sexes. Thus a female with male-like genitalia will be confused by her anatomical similarity to males, when her family regard her and bring her up as female. Similarly confusion results when a female who has been reared as a boy is converted to a girl upon discovery of her genetic sex. The psychosexual pattern of the individual becomes indelibly imprinted very early in life, apparently during the second year, and Money, Hampson and Hampson have found that change of rearing after 18 months is likely to result in serious disturbance to the patient. Fortunately, so far as patients with virilizing adrenal hyperplasia are concerned, early recognition of genital anomalies and treatment with cortisone prevents masculinization of females and the unhappy confusion is avoided. Plastic surgery will rectify the genital abnormalities, and such individuals may take their places as normal, healthy females, provided, of course, that they continue the treatment for the duration of life. The implication is that the gender role is established in close conformity with the appearance of the individual and the relationship established with other persons, most notably the family. The genetic sex makes very little difference. These general conclusions have been reached through study of a variety of types of ambisexuality, including genetic males whose anatomical configuration is female. As a result of these studies we see evidence that the gender role is not automatically dictated by the inherited genetic material but is extremely responsive to post-natal environment and social milieu.

Conclusion:

One could cite many more examples of

the influence of heredity on health and disease, but perhaps these discussed will have shown the intricacies of the expression of inherited potentialities in various environments which form the individual who experiences health and disease. This is the stuff of which variation is made, no less in disease than in health, and this the physician must recognize if he would give his patient good care.

All disease is a family affair in the sense that demands are made upon time, energy, emotion and finances. Perhaps genetic disease is more so than most because the defects are so often permanent or long lasting, and there is the risk to run of disease in subsequent children. The answer to these problems lies in the discovery of the mechanisms of gene action, so that the damaging effects of deleterious genes may be prevented or if this is not possible an appropriate treatment may be devised. It is encouraging to know that these problems are being attacked with great vigor. New and more refined methods for the measurement of biochemical functions are becoming available all the time, and the medical literature is filled with reports of research illuminating the nature of the genetic aspects of disease. One day we will have means of prevention and treatment which will relieve a serious strain on the health and well-being of many families.

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II. THE MAKE-UP OF THE HEALTHY FAMILY

FREDERICK OSBORN

IN RECENT YEARS THE WORD HEALTH has been given a broader meaning. It now includes almost all aspects of human well-being. We speak of the mental health of the individual as naturally as we speak of his physical health. We speak of a healthy relationship between individuals. We know that there are healthy attitudes, and other attitudes which are not so healthy. When we speak of the nation's health, we generally mean not only the health of the nation's individuals but also their economic well-being. Recently too we have learned that all these aspects of health are interrelated. Doctors are using the term psychosomatic, and I believe it can be applied to the family and the nation as well as to the individual. Health, like liberty, is indivisible.

So today we are using the term "The Healthy Family" in this broad and all inclusive sense.

The healthy family is the product of its social and biological inheritance. No one takes exception to this statement when it is couched in such broad terms. But when we try to define how much differences in family health have been affected by the respective contributions of the environment and of genetic inheritance, we find ourselves in a field in which argument and even bitter controversy has raged these many years. In some quarters the argument still rages. But thoughtful people have come to realize that while it will be nice to have this point settled, it is not of much practical importance to the effort to improve family health. Our thesis is that practically all sound proposals for improving the social inheritance would tend to improve rather than injure the genetic inheritance.

There are great variations in health as between different families. Some families contribute far more than their share to the clientele of hospitals, sanatariums, police courts, and state institutions; others less than their share; and a few stay entirely clear of them for generations. Luck may play a part, but in general these variations are related to both the social and genetic inheritance of the parents, to training, education, friends, neighbors, the community, and all the intangible influences of the particular environment with which they react. There have been a number of objective statistical studies of the relation of family health to most of these variables, and we are beginning to know something about them.

Of all the influences which affect the health of the family, the parents themselves are the most important. In the United States, parents who are physically and mentally healthy above the point of subnormality can always, barring unusual circumstances, provide their children the necessities for a healthy physical growth. In proportion as the parents are happy in their relation to each other, as they show their children constant affection, give them consistent training when they are little, provide a friendly and cheerful atmosphere in the home, they are training them in mental health and in healthy interpersonal relationships. In proportion as the parents watch and understand the mental growth of their children in its various stages and provide them with appropriate intellectual stimulus at the appropriate time, they are providing the atmosphere for that intellec-

tual growth which is the highest attribute of health. Finally, from or through their parents, children receive the genetic base with which all elements of the environment interact to produce the mature individual.

To get healthy families, we must start with the right parents. Obviously the place to find healthy parents is among people who have been brought up in healthy families. But this seems to be a circular argument. For our present purpose we had better first consider how parents can be trained for a healthy family life. A great deal is being done along these lines. The Children's Bureau of our Federal government distributes well-written and authoritative booklets covering the needs of children at different ages. The newspapers carry columns of advice to parents, most of it good, some of it exceedingly well done. The great national weeklies carry well-presented articles about family life. Psychiatry has made important contributions to knowledge of how to bring up normal children, and gradually we are learning to apply them with practical good sense. Marriage counseling services are developing rapidly and render valuable service; there are child and parent clinics, and a variety of state and county and city mental health services.

All these guides to a more healthy family have developed in the past forty years; some very recently indeed. We can be confident that they are having an effect, and that since each generation of children should as a result be better prepared for parenthood, the effect should be cumulative. But it is possible that we have in our society an offsetting factor which from generation to generation tends to offset these gains. If the parents least qualified to make a healthy family have on the average more children than those most qualified, each generation will in turn start out with a larger proportion of children ill adopted or ill prepared for parenthood. We do not know whether or not this is the case. It would be a hard thing to find out. But we do know very definitely that on the whole children from unhealthy homes are a retarding factor, and children from healthy homes represent a gain, and that both the gains and the losses are certain to show up in the next generation.

There is a self-evident cure for this anomalous condition; namely, to provide such conditions in our American society that fewer children will be born in unhealthy families, and that more than the average number of children will be born in healthy families. This may seem a novel idea, but it is worth giving thought to. We have already listed some of the things that are being done to improve family health through the education of parents. We were about to list a number of proposals now currently discussed, for environmental changes which would also help to improve family health. It may be worth while to analyze both lists from the point of view of their effect on family size in different types of families.

The most important factor affecting size of family is the culture pattern of family limitation which during the past sixty years has spread throughout the western European countries. At the start it spread unevenly, beginning with the higher income groups and as a result the first effect of family planning in this country and in most of Europe was to increase the so-called social-class differentials in births. Some geneticists believe that such differentials result in a deterioration of our genetic inheritance. Other geneticists discount this danger. But quite apart from our genetic inheritance, we can be sure that our social inheritance is not going to be improved so rapidly if in each generation the more responsible or more educated parents have fewer children than the poorly educated, or the less responsible.

Today in the United States the birth differentials between socio-economic groups seem to be diminishing as family planning spreads more evenly through the country. The proportion of families with five, six or more children among the lowest eco-

nomic groups has continued to fall right through the period of the baby boom, while the white-collar and higher economic groups, who had severely limited the size of their families during the depression, have been the major factor in increasing the birth rate since the war.

There is another recent trend highly favorable to a better distribution of births. A number of studies have been made on groups of people all of whom practice family limitation fairly effectively. All these studies provide evidence for believing that when people take some pains to limit the number of their chlidren, the people with the lowest incomes have the fewest children, and the number of children increases in direct proportion to increase in income. Better still, there is evidence that the larger families are born to the more responsible parents in such groups, parents who give their children a better home environment and are more respected in the community. This evidence needs to be reinforced by larger studies, but the trend is clearly encouraging. It looks as though the planning of family size, which is so rapidly becoming universal in this country, automatically brings about some improvement in the distribution of births even under present social conditions. Evidently a great deal more could be done if we studied our social institutions and modified them to further these trends. In particular, everything we are trying to do to improve family health should be thought about from this point of view.

All of the activities listed under the head, "Education of Parents," seem to us influences favorable to a better distribution of births. Parents most receptive to these educational influences would with better understanding of the problems have an easier and happier time rearing their children and would seem more likely to have another child. Parents less able to accept such guidance are less likely to be affected one way or the other. If marriage counseling and advice to parents includes an appreciation of the values and happiness to be found in a larger family, the effect on family size should be even greater. It might be argued that too much emphasis on the problems of child rearing tends to make parents over-anxious, and hence afraid to have more children. It doest not seem to us likely that this would happen to really healthy parents. But such anxieties might well reduce the number of children in less healthy families.

Much stress is laid on slum housing as an environmental cause of juvenile delinquency. Bad housing conditions also encourage the irresponsible breeding of children who are not going to get proper home care, for bad housing conditions encourage carelessness and loss of self-respect. But if the only effect of improved housing was to restrict family size, it would also be a one-sided influence on the better distribution of births. Good housing should make possible larger families among responsible parents. In developing housing projects, thought should be given to providing space adequate for a certain proportion of large families, at a cost which would not unduly penalize the parents for having more than three or four children. Government housing projects in Sweden and other Scandinavian countries have included such provisions, and this kind of planning should not be impossible in this country.

Education tends to raise the age of marriage. If marriage is put off too long, a smaller family results. This should be watched. But in other respects, the better our system of public education, from kindergarten through college, the more likely that intelligent and responsible parents will have that extra child, while the irresponsible and careless are hardly likely to be stimulated by education a generation away. At privately endowed colleges the system of undergraduate scholarships usually provides help for the able children of low-income families, and should thus encourage thoughtful parents to have more children. But the system of post-graduate

scholarships has just the reverse effect. The small size of the scholarships combines with the atmosphere of the post-graduate schools to postpone marriage to an age at which these men and women are not likely to have large families. Yet it is probable that many post-graduate students are far above the average in the affection, care and wisdom with which they would raise their children. Combined with high intelligence, these traits should make for the finest sort of home environment. It should be made possible for graduate students to get married at an earlier age.

We do not have family allowances in this country, but they need to be discussed because they are in use in England, Canada, Sweden, France, and in fact in every country inhabited by people of western European descent except the United States. There is much discussion of them in this country especially in Catholic circles, and a very real possibility that they might emerge rather suddenly if we should have a severe depression.

Family allowances were developed in Europe either to raise a birth rate which was considered too low or to ameliorate the poverty of low income families with a large number of children whom they could not otherwise properly feed and support. Neither of these reasons applies to this country. We do not consider our birth rate too low. Wages, even at the minimum rate, are in general sufficient to provide food and necessities for quite large families. The children of chronically unemployed and dependent families are taken care of by many sorts of community, state and federal programs. If these are not sufficient, they should be enlarged. But there seems no reason to go in for a system which in other countries, so far as the records show, has made no improvement in the distribution of births, and on the contrary has at least in some instances tended to increase births among the least competent parents.

We should analyze for their effect on births among families of different types, such social activities as school lunches, public health nursing services, recreation, county clinics and all the apparatus of public health and social welfare. In most cases the effect of these activities is probably to make for more births among the more responsible families. They should be studied for modifications which would make their influence as discriminating as possible. Many of the changes would probably be along the lines of training personnel in the psychological influences which affect size of family. Until all the fine body of professional people engaged in the task of improving family health realize that it is no kindness, but only an injury to parents and to children to encourage further parenthood among parents who have already demonstrated their incapacity to care properly for children, our institutions won't have the effect we want them to have.

The strongest pressures on parents trying to decide whether to have another child, are the pressures of community opinion. If friends and relatives, ministers and doctors, the whole atmosphere of the community express a clear attitude as to whether they should have another child, the influence is likely to be decisive. This requires a discriminating opinion, applied to each particular couple. This opinion may best be based on how well the couple are bringing up the child or children they already have. If their home is one which gives expression to a constant and affectionate care, if another child is wanted and would not seriously endanger the family living standards, the atmosphere about the parents should be one of enthusiastic approval even if they already have four or five children. If their home does not meet these conditions, they should not be encouraged to have a larger family. Such discriminating attitudes will require considerable education. We are all too apt to think in simple terms, such as "small families are better" or "people ought to have large families." These subconscious and often, in particular cases, erroneous ideas influence our attitudes and

have their effect on the people we see. We owe it to the next generation to be more discriminating.

Many other physical and psychological conditions of the environment bring pressures to bear on decisions as to whether there should be another child in the family. All these conditions should be studied for their effect, or how they might be maintained, altered, or increased. In the aggregate they constitute the intimate and personal reasons why a couple decide to have or not to have another child. Few couples are influenced in such a decision by the interests of society at large. A distribution of births favorable to society and to future generations can only be brought about by creating conditions in the environment which will tend to stimulate parents to the right decision.

There is little or no extra cost or public expenditure attached to what we are proposing. Nothing in the proposal runs counter to the things we are already doing to improve family health. All that is needed is first, the acceptance of a new idea; second, the development of a more discriminating public opinion; third, continuing studies of the effects of different environments; and fourth, such modifications of our institutions as are indicated by these studies.

The results would accelerate our present efforts to improve the environment and social inheritance of the next generation. The effect would be cumulative from one generation to another, each generation of children getting a better start than the one which preceded it. We would no longer need to be anxious about the genetic deterioration of the higher qualities of the race, for such a distribution of births could hardly lower our genetic potential. It might indeed carry the hope of a real improvement.

III. HEREDITY COUNSELING

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THE COUNSELING OF INDIVIDUALS OR FAMILY groups with regard to matters of heredity may at times cover a very wide area. Questions concerning the inheritance of normal or abnormal characteristics may confront the marriage counselor, the psychiatric adviser, the family physician, public health workers—in fact anyone who is concerned with giving advice in family problems. Unfortunately, an adequate knowledge of the basic principles of genetics, upon which all heredity counseling should be based, is not available to the majority of workers in these allied fields.

Within the past fifteen years there has been a growing awareness on the part of the general public of the need for professional advice in matters of heredity. This has resulted in the establishment of counseling centers or heredity clinics in at least a dozen of our major universities and medical centers (Dice, 1952). These centers, which are also concerned with teaching and research in human genetics, are able to offer a professional consulting service of high quality. As some evidence of the public interest and timeliness of the topic, a popular article on heredity clinics by Brecher and Brecher (1955) appears in the current issue of Redbook magazine. Somewhat similar articles have recently appeared in Collier's and in other popular magazines. The nationally syndicated newspaper column on medical advice by Dr. Walter Alvarez frequently discusses problems of heredity, and Scheinfeld's popular book, *You and Heredity*, continues to enjoy wide circulation.

Normal Traits

It may be of some interest to examine the types of problems that are presented to heredity counseling centers. While no two family problems are exactly alike and each problem requires individual treatment, those presented can be classified into several broad groups. Reed (1952) has listed the twenty subjects about which information is most frequently requested from the Dight Institute for Human Genetics at the University of Minnesota. While it is to be expected that the experience of different centers will vary considerably with regard to the relative frequency of questions of various types, the general categories remain much the same. It is to be expected that centers located on a large university campus would receive a high proportion of inquiries concerning the inheritance of normal characteristics, while those located in medical centers would be predominantly concerned with hereditary diseases. In the experience of the Dight Institute, questions concerning education and genealogy are the most frequent. This classification would include all questions concerning the inheritance of normal intelligence and special abilities. Questions concerning other normal characteristics that rate high on the Dight Institute list are those of the inheritance of eye color and skin color and the occurrence of twinning. Problems of this sort are less frequently encountered at the Bowman Gray School of Medicine.

It is a seeming paradox that our information concerning the inheritance of normal characteristics in man is in many instances

less complete than our knowledge of abnormal or disease characteristics. This is largely due to the fact that many normal characteristics represent the combined action of multiple genes or hereditary factors, often modified considerably by the environment, whereas the majority of diseases in which hereditary factors are important are conditioned by the action of a single abnormal gene. For example, the best available information concerning the inheritance of normal intellectual ability, as measured by the various intelligence tests, indicates that the genetic contribution cannot be less than 50 per cent or more than 75 per cent of the total measured variation of normal or moderately deficient intelligence (Kallmann, 1953). Environmental factors, including education, account for at least 25 per cent but not more than 50 per cent of the variation in this characteristic. Both factor analysis of intelligence and present concepts of the physiology of intellectual processes make it clear that multiple genetic factors as well as environmental factors are involved in normal intellectual ability. In contrast, Huntington's chorea, which is a severe neurologic disease characterized by uncontrollable jerky movements and by mental deterioration and disorientation, is due to a single abnormal or mutant gene with minimal modification by the environment. It is obviously easier from an investigative viewpoint to determine the genetic mechanisms involved and to develop useful predictive information in the case of an outstanding abnormality due to a single mutant or abnormal gene than to determine the effects of multiple genes influencing normal characteristics. On the other hand, the inheritance of certain normal characteristics due to single gene effects, such as the blood groups, are well understood, and these traits are useful tools for a number of purposes. Advising families concerning the inheritance of normal traits, particularly special abilities, is certainly the responsibility of the genetic counselor. While adequate answers are available for some problems, much additional research in this line is needed.

Cousin Marriage

A second type of problem frequently encountered concerns the possible effect on children of the marriage of cousins. The marriage of closely related individuals is prohibited by law, church regulation, or social custom in many cultures. Folk tales and superstitions concerning the ill effects to be expected from close in-breeding are common. Many intelligent people therefore inquire concerning the scientific basis for these beliefs. Such requests for information usually come from the interested young people themselves or from their immediate families, usually before marriage is contracted.

The basis of the cousin marriage question lies in the frequent occurrence in normal individuals of undesirable hidden characteristics, referred to as recessive traits. The basic units of inheritance, the genes, occur in pairs in the nucleus of each cell. An abnormal or mutant gene may be weaker in its physiologic action than its normal partner, and may produce no recognizable effect on the individual possessing it. If two individuals carrying the same hidden characteristic, or recessive gene, should marry, one-fourth of the children would receive the same recessive gene from both parents. In double dose, and without a normal gene to mask its effect, the recessive gene may produce severe disability or fatal illness in the unfortunate child. There are hundreds of different recessive genes known, no one of these being particularly common, but in their aggregate amounting to a large number. Each individual probably has somewhere between 20,000 and 40,000 pairs of genes (Spuhler, 1948). One-half of these genes are identical in a parent and child, for a child receives half of his genes from each parent. One-eighth of all genes will be identical in two first cousins, because this is the proportion of genes derived from ancestors common to both in-

dividuals. If an individual has one or more abnormal genes, the probability that this same gene will be present in a first cousin is therefore one in eight. On the other hand, the probability that this same abnormal gene might be present in an unrelated individual picked at random from the general population might not be greater than one in 500 or one in 1,000. The difference in betting odds between one in eight and one in 500 for matching a specific undesirable characteristic in the marriage of first cousins versus unrelated individuals is obvious. For second cousins the risk becomes less, as one in 32 of their genes are identical, while for third cousins the proportion of identical genes is only one in 128.

It should be pointed out that the effect of cousin marriage is only to intensify or bring to light characteristics that are already present in hidden form in a given family. If the characteristics of the family are all normal, no ill effect would be anticipated. Unfortunately, none of us can know what recessive characteristics he may be carrying, and we can never be sure that any cousin marriage is free from risk. Of course any marriage carries a perceptible risk that some of the resulting children might be abnormal or handicapped in some way. The effect of cousin marriage is to increase this normal risk several-fold. As a general principle, one can state that the marriage of individuals related as closely as first cousins is always potentially dangerous and should be generally discouraged. The marriage of second cousins is less dangerous, and for third cousins the added risk becomes quite small.

Hereditary Diseases

The type of problem most frequently referred to the genetic adviser concerns families in which one or more cases of an hereditary disease have already occurred. The number of disease processes in which genetic factors are of considerable importance would number several hundred, and genetic problems are encountered in all fields of medical practice. The questions presented to the genetic adviser by such families usually fall in two classes: (1) Will an individual known to have a given hereditary abnormality transmit this disability to his children? (2) Where one or more abnormal children have appeared in a sibship, what is the probability of recurrence of this condition in possible future pregnancies? In many conditions the genetic mechanism is well understood, and predictions concerning future children can be made with confidence and exactness. In many other conditions the genetic factors are not so well known, and predictions cannot be made with equal confidence. Empiric risk figures for certain types of marriages, based on observation of large numbers of families, are available for a number of conditions where the exact genetic mechanism remains obscure. In spite of considerable study, the mechanism of inheritance of the malformation known as harelip and cleft palate remains uncertain, and it seems possible that both environmental and genetic factors may be involved. By observation it is known that of all children having one parent with harelip (with or without cleft palate) and the other parent normal, approximately 2 per cent will have harelip. If one parent has cleft palate without harelip and the other parent is normal, 7 per cent of children will have cleft palate. In families where the parents themselves are normal, but one child with harelip has appeared, the probability that the next child will have harelip is 4 per cent. If one parent and one child have harelip, the risk the next child may also be affected is increased to 14 per cent. Similar empiric risk figures are available for a number of other conditions.

In order to render sound genetic advice in problems involving hereditary disease, the adviser must be in possession of the published information acquired by study of the specific condition in question and must also have an adequate knowledge of the family concerned. Certain conditions may be in-

herited in different ways in different families, and there is no substitute for careful, extensive and intelligent investigtation of the family in question by the adviser.

Adequate study of a family will usually permit the investigator to specify the probability for abnormality in future children. One can usually estimate the degree of risk that would be involved if a given husband and wife decide to have more children. It is the responsibility of the genetic counselor to make available to the parents the most accurate risk information that can be obtained, and to see the implications of the risk assessment are understood. However, the adviser should not attempt to make a decision for the family or urge them to adopt some particular course of action. The question of having children is a very personal and individual one and will be influenced by many considerations of religion, temperament, economic and other factors. These can be evaluated best by the husband and wife concerned. One may often encounter couples who will make opposite decisions in the face of similar risk figures. Two brief examples may demonstrate that such opposing decisions may be at times justified.

A young couple was seen in the clinic whose first and only child had recently died of a severe and uncommon neurologic disease, infantile cerebral sclerosis (Krabbe's type). This condition is usually due to a recessive gene. The family history suggested that the usual mechanism was operating in this family, with both parents being carriers of the abnormal gene. On examination, both parents were quite healthy, above average in intelligence, and apparently quite stable psychologically. They had been told that their child's illness was "hereditary," and they had developed a certain feeling of guilt, holding themselves somehow responsible for the death of their child. They greatly desired children of their own, but had assumed without justification that all future children would be abnormal. From the available information it could be predicted that the chance that the next child would die of cerebral sclerosis was 25 per cent, while the chance of a normal child was 75 per cent. Of course a normal child would have a two-thirds probability of being a carrier of the recessive gene. This couple was agreeably surprised to find that they had a 3 out of 4 chance of having a normal child. They wanted children badly enough to feel that this risk was not excessive.

Interviews with the genetic counselor and with a psychiatrist dispelled the mild guilt complex concerning the death of the first child. It is of importance to note that the parents understood the magnitude of risk involved in pregnancy and were psychologically prepared to accept the situation if the second child should also die. Without psychological preparation for possible failure, the shock of a second abnormal child could have serious effects. A seven-year follow-up disclosed that this couple had two normal children, and then decided they had pushed their luck far enough. The resulting family was a happy one, and in every way an asset to their community.

A marked contrast is provided by another family seen at a time when they had four children. The first and third children were normal, while the second and fourth were severely ill with cystic fibrosis of the pancreas. The older of the affected children, age 5 years, had spent several months in hospitals and could not be expected to live long. The youngest child, less than a year old, was also in the hospital. This disease is ultimately fatal, but the illness is often of several years duration. The financial burden of protracted hospital care for two children was severe. Here again the action of a recessive gene was indicated, and the probability that the next child might also have cystic fibrosis of the pancreas was 25 per cent. This risk figure was completely unacceptable to these parents. They felt that they could not face the prospect of another child with a prolonged and fatal illness. They also felt that the expense of

another affected child would unfairly penalize the two normal children. After deliberation of several weeks and consultation with their minister, the husband requested surgical sterilization and a vasectomy was performed.

Similar examples could be quoted involving other mechanisms of inheritance and risk figures of different levels. In situations similar to that of the second family, a risk of abnormality in the neighborhood of 5 per cent may seem too large to some couples. Each family presents a unique set of circumstances, and in each case the husband and wife concerned should make their own decision concerning future children, in the light of the best available medical, genetic, social and personal information. It is the duty of the family physician to assist the couple in carrying out any decision at which they arrive freely. Should they elect to refrain from further childbearing, adequate contraceptive advice or surgical sterilization should be made available. A more extensive discussion of the principles underlying counseling in families with hereditary abnormalities will be found in the report of a panel discussion on genetic counseling conducted by Professor L. R. Dice at the 1952 meeting of the American Society of Human Genetics (Dice, *et al.* 1952).

There is another side to heredity counseling in families afflicted with hereditary disease that has a brighter outlook but is not often emphasized in discussions of this topic. A surprising amount of superstition and misinformation is encountered by those doing genetic counseling. Many tragic situations are seen, such as middle-aged persons who have unnecessarily avoided marriage, and marriages that have broken up because of an unfounded fear of pregnancy. Incorrect beliefs that their children are likely to be abnormal are often met in intelligent families, and are responsible for much needless mental conflict. In any family in which one may identify individuals with a high risk for having abnormal children, one can also identify individuals whose children will, in all likelihood, be entirely normal. Reed (1953), in an excellent discussion of the philosophy of genetic counseling, points out that the overall effect of such counseling is to encourage people to have more children than they had thought wise, as the chance of bad luck is often less than they had assumed. It is the responsibility of the genetic counselor to allay fear and counteract the effect of superstition and misinformation. Individuals whose fears are unfounded should be reassured and encouraged to live normal lives.

The marriage counselor should be alert to identify cases in which marital discord is based on fear of pregnancy secondary to a belief that children might be abnormal. The apparent problem that brings the couple to the marriage counselor will not be properly resolved unless this deeper cause is detected and brought into the open. People have a tendency to exaggerate fears of things that they do not understand. A careful genetic study, with assessment of the risks involved, can sometimes dispel a cloud that is blighting an otherwise sound marriage. Problems of this sort can sometimes become quite complex, requiring the cooperative services of the family physician, the marriage counselor, and the genetic counselor (Herndon, 1954).

Disputed Paternity

Heredity clinics can also be helpful in marital problems involving any dispute concerning the true paternity of a child. For many years, medico legal blood testing has been accepted as competent evidence by our courts in cases of disputed parentage. While such tests can never prove conclusively that a given man is, beyond question, the biologic father of a given child, they can frequently prove the reverse, showing that it would be biologically impossible for a given man to be the father of a given child. These tests are most often employed in court actions and constitute almost the only type of objective evidence that can

be produced by a man who is falsely accused of being the father of an illegitimate child. Proof of innocence cannot be furnished for all men wrongly accused. Use of the testing sera generally available will provide exclusion in approximately one-half to two-thirds of such cases. The probability of obtaining exclusion depends upon the number of genetic tests employed, and the frequency of the genes controlling these characteristics in the population under consideration. Methods of estimating the probability of excluding paternity in different racial groups and under different conditions of testing are given by Boyd (1954). It should also be obvious that blood testing procedures can frequently be used to help solve domestic problems that are not in the courts, and when the concerned parties wish to avoid the publicity of legal action. Furnishing proof to a suspicious husband that his suspected rival could not possibly be the father of the wife's child has averted divorce on several occasions in the writer's experience.

Research

Recent developments that have pointed out new avenues for research strongly suggest that heredity counseling may be considerably more effective in the future than it is now. One of the chief difficulties at present, as suggested in the discussion of cousin marriage, is our inability to recognize carriers of severe disabling recessive traits before one or more abnormal children have appeared in a family. Research directed to the problem of identifying carriers of recessive genes has already produced useful results and there is promise of more to come. At present carrier states can be identified, with varying degrees of reliability, for about 30 hereditary abnormalities (Falls & Neel, 1954). These developments place within our reach a tool for prevention of a number of hereditary diseases that can be utilized in connection with premarital examinations. If proposed matings of two carriers of the same abnormal trait can be detected prior to marriage, it is possible that the concerned parties might change their minds and seek other marital partners. If they did marry they might prefer to adopt normal children rather than run the risk of bringing severely handicapped children into the world. While exact information of this type is available for only a few conditions at present, there seems to be good hope that future work in this field can expand these facilities considerably.

Another area of research also gives hope for prevention of certain hereditary abnormalities. In a number of conditions it has been shown that both inherited and environmental factors are necessary to produce disease. In other words, one inherits a specific susceptibility to environmental stress that would be harmless to the normal individual. For example, the susceptibility to diabetes is certainly inherited, and risk tables are available specifying the likelihood that any given relative of a known diabetic might later develop the disease (Steinberg, 1955). It also seems certain that environmental agents, harmless to the normal individual, are also necessary to precipitate clinical disease in a person genetically susceptible to diabetes. Kallmann's (1953) research demonstrates that a similar interaction of hereditary and environmental factors may be concerned in the etiology of schizophrenia and other mental illnesses. Research is now being directed toward identification of the precipitating environmental factors in these and in other conditions. If the precipitating factors can be adequately defined, family studies can identify the probably susceptible individuals, and measures can be taken to protect susceptible persons from precipitating conditions.

Eugenic Implications

The counselor concerned with any problem of heredity must always bear in mind the possible eugenic or dysgenic effect of any advice he may give. The counselor

must not only be concerned with the specific problem in inheritance raised by a given family but must also attempt to make some assay of the total genetic endowment of the persons in question. This is obviously a difficult thing to do, as we have no exact yardstick for assaying an individual's genetic worth or for measuring his value to society. Differences of opinion are to be expected in any area where a decision must be based on judgment and experience rather than actual measurement. Probably most people would agree that a minor genetic abnormality correctable by surgery, such as having six fingers or toes, should not be considered grounds for limitation of family size, particularly in a family that has produced individuals of outstanding intelligence and ability. On the other hand, most people would agree that it would be advantageous for reproduction to cease in a family producing successive crops of idiots and imbeciles. Between these extremes will lie many instances in which even the most mature and discriminating judgment will find difficulty in drawing a line between those whose offspring will be assets to society and those whose offspring will be liabilities. In the majority of cases, however, careful study of the family should contribute to a wise judgment on this point. The necessity for considering each family on its own merits as an individual and probably unique case cannot be over-emphasized. While the final decision concerning family limitation in case of severe genetic disability should always rest with the parties concerned, assuming their mental competence, it should also be the responsibility of the counselor to point out the bright side of the picture in families whose reproduction should be encouraged. It should certainly be the responsibility of the marriage counselor, the family physician and the genetics counselor to encourage reproduction in families possessed of a high order of socially valuable characteristics. Generally, though admittedly not in all cases, advice concerning heredity that is sound and advantageous for the individual family will also be found to be sound and advantageous for society as a whole.

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PERSPECTIVES IN POPULATION EUGENICS

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THE ADAPTATION OF A SPECIES to a new environment is an extremely complex process. Under natural selection it is very slow, requiring hundreds or thousands of generations. The complete transformation of a species into its geological successor may take a period of time on the order of a million years, although the interval must vary over a wide range for different species. Among the factors which determine the rate of transformation, one of the most important is the intensity of selection. Artificial selection as practiced by man with his most useful animals and plants combines a relatively strong selection with hybridization, favorable population structure, and other contributing influences. As a result, some of these protected species have undergone changes in a few thousand years that Nature could have accomplished only in a million years; changes, in fact, which Nature might carefully have avoided. With modern genetic knowledge, comparable changes might be effected in twenty years of intensive breeding and selection.

Recognition of these facts led early eugenists to the conclusion that we could apply somewhat analogous methods to ourselves and, in a few generations or centuries, obtain great improvements in average intellectual endowments. It is not my intention altogether to dispel this hope; I am ready to believe that at some future time human evolution will be greatly accelerated, though not entirely controlled, by human efforts. In the present state of science and social organization, however, such an undertaking would be difficult to justify. Several lesser objectives, while not central to eugenics as usually envisaged, deserve more immediate attention and may provide the necessary foundation for a more ambitious eugenics program to follow.

Genetic Obstacles to Accelerated Human Evolution

Quite apart from sociological considerations, there are at least three genetic reasons for regarding assistance or acceleration of our own biological evolution as the most difficult and the least urgent objective that eugenics could at present set for itself.

The first reason is that the analogy between selection in man and in agricultural species is not a close one. Artificial selection as practiced on plants and farm animals owes much of its effectiveness to the fact that, within a single breeding population, all members may be descended from a single selected individual within one or two generations, and an improved form can easily replace other forms with little or no intermixture. Human populations are so enormous compared with the reproductive potential of the individual that immediate displacement of a breeding population by a selected type is out of the question. Changes would have to be achieved by slight differentials in reproduction with much intermixture, even if "improved forms" could be easily recognized.

Secondly, natural selection has some great advantages over artificial selection in adapting a species to a complex environment such as man will always face. Natural selection tests every gene countless times over in a very large number of genetic and environmental settings; it increases or decreases the frequency of every gene according to its average value to the species. Since very few individual genes will ever be identifiable in every person who carries them, our knowledge of single genes can be of little value in scientific selection as applied to most human traits. Like natural selection, any program of assisted evolution in man would have to rely upon

phenotype selection, that is, upon selection of individuals according to their attained qualities.

Finally, natural selection must have continued with little change up to the present time in uncivilized peoples, presumably favoring good intelligence, if we define this as the capacity to learn and to adapt to the environment. Yet it does not appear that the Japanese Ainu, for example, are more intelligent than related peoples who have been civilized for 2000 years. Twenty thousand years of natural selection certainly did not bring great intellectual improvement in the descendants of Cro-Magnon man. Although we have no definite information on the next point, it probably required at least 200,000 years of unhampered natural selection to transform a creature of definitely human status, as seen in Java man, into people of modern intelligence. In order to produce noticeable effects on average intelligence in one or two centuries, therefore, a scientific program of selection in man would have to be at least ten, and perhaps fifty times as efficient as natural selection.

The principal reasons for the relatively slow response of intelligence to selection of any kind appear to be the genetic complexity of intelligence and its very large dependence on environment. Because of complex interactions of genetic factors with each other and with the environment, some genes which are compatible with high creative intellect in one individual may prove deleterious in his descendants. This is illustrated, for example, by the distribution of mental disorders among gifted people and their relatives (1). The actual ability of a family or population to multiply or to survive may bear only a loose relation to their native intelligence; cultural heritage plays a more decisive role in this competition.

Pursuing the last thought a little further, however, we discover one inefficiency of natural selection that could surely be improved upon in a scientific system of selection. Throughout human evolution, the most intelligent and talented persons have probably failed to reproduce any better than, or as well as, their neighbors. Through their contributions to the cultural heritage of their community, however, the population producing many leaders or thinkers would be favored in competition with populations that produced fewer. This may have been Nature's best device for enhancing man's more abstract intellectual capacities.

There is, however, a bright side to this picture. If the genetic basis of human intelligence is as stable as the above reasoning suggests, and if natural selection acts so slowly in its maintenance and development, then any relaxation or reversal of natural selection would cause only a very gradual decline in genetic potentials.

In what directions, then, can eugenics hope to make significant contributions to human welfare within the next century, and to what extent should the present eugenic program be concerned with longer-term objectives? It appears that two kinds of program, already embarked upon in some countries wisely or unwisely, promise early rewards to nations that can effectuate them scientifically. These are negative eugenics and population control. In addition, some benefits might be derived within a few generations from a program of positive eugenics; whatever could be accomplished by this means would appear to be predominantly an improvement in cultural inheritance, with incidental and perhaps negligible genetic gains. These three short-term objectives all require extensive research and planning. The long-term objective of conserving or improving the overall genetic legacy of future generations is not yet clearly in sight, but certainly deserves some attention in present research.

Negative Eugenics

Clinical eugenics, in the form of genetic counseling, is already establishing itself as a proper part of medicine. That this approach will achieve results sufficient to

change population statistics in the foreseeable future may well be doubted. We should not scorn the protection of individual families from genetic catastrophe, but our concern in this discussion is with population eugenics.

As geneticists have repeatedly argued, only dominant defects, and recessives which are sex-linked or very common, can be rapidly reduced in the population by limiting reproduction of affected persons. To limit reproduction of healthy carriers of known hereditary diseases would be difficult and genetically unsound, although justifiable exceptions may become increasingly common with advances in genetic knowledge. There is ample precedent for taking public health measures against the spread of disease by affected persons, even to their own families. Recently, conservative measures which violate no traditional human rights have been urged by a British health officer (2) with respect to Huntington's Chorea. These are, mainly, the routine reporting of all diagnosed cases, followed by investigation and counseling of their families. While dominant or common recessive defects may account for only a small proportion of the handicapped, their absolute numbers are certainly large enough to deserve public attention. It has been estimated that in England and Wales there may be 2000 cases of Huntington's Chorea and perhaps twice as many healthy young persons destined to develop the disease. In the United States, according to conservative estimates, there may be 10,000 persons with hereditary bleeding diseases resembling hemophilia. Schizophrenia, which may depend largely upon a simple hereditary factor, affects one per cent of the population, and the frequency of diabetes mellitus may be as high as two per cent. The identification of all serious hereditary diseases and the incorporation of conservative control measures into public health programs would achieve as much in a few generations as present expenditures on psittacosis, rabies, and other rare diseases.

The argument for negative eugenics must be tempered, however, with two reservations that emerge from modern knowledge of genetics:

First, natural selection has only recently been frustrated with respect to such severe disorders as diabetes or hemophilia. We can therefore not expect to reduce the frequency of these conditions much by restricting reproduction of affected persons. Mutation alone has probably prevented their eradication, and would continue to do so in the face of stringent eugenic controls. By the same token, however, if no substitute is found for natural selection, the diseases in question will increase in frequency.

Second, any recessive or irregularly dominant condition which is common may be "paying its own way" by conferring some advantage upon heterozygous carriers or upon persons with favorable modifying factors. This is the principal reason why, as a general rule, only affected persons and not healthy carriers should be required or advised to limit their reproduction.

Another argument is frequently advanced against negative eugenics. With respect to persons having severe hereditary handicaps early in life, natural selection is relaxed under civilization only to the degree that social measures and medical science are able to reduce the severity of the handicap. From this it has been concluded (3) that we should let medical science and Nature take their course, and allow the frequency of the diseases to increase up to the limit imposed by the social and economic burden of maintaining these people. At that point, presumably, the number of untreated persons would become large enough to reestablish natural selection. This would be a valid genetic argument against eugenic measures only insofar as the genes involved might have secondary, useful effects. It is in sharp disagreement with public health principles, which require the prevention of diseases even though satisfactory treatment may be available. Furthermore, if, as suggested here, negative eugenic measures are

applied only to dominant or to common recessive diseases, and mainly to individuals who are actually handicapped, this argument loses most of its force.

Population Control

Family planning, by one method or another, is now almost universally accepted in civilized countries as a desirable means of protecting health and happiness. Population planning on a national scale is also accepted in many countries, and generally operates by means of family allowances, fertility clinics, etc., to encourage families either to increase or to limit their size according to assumed national needs. Furthermore, among the normal mechanisms in human society that are capable of reducing birth rates, there are some beside overpopulation and its correlates, stressed by Malthus. Evidence of this is given by the population history of the U.S., where fertility began to fall from its peak in the 19th century, long before the country could be considered overpopulated. These mechanisms, chiefly age at marriage and complex psycho-social factors, may ultimately provide a better approach to the regulation of population size than direct economic or legal controls.

Sir Charles Galton Darwin in *The Next Million Years* (4) has maintained that any present tendency for cessation of population growth is temporary, and that eventually all countries will outgrow their resources. It is his contention that until man has evolved into a completely new species, in perhaps a million years, he will continue to reproduce essentially like an animal, so that Malthusian principles will determine the rise and fall of successive civilizations. One may well question the estimate that a million years, or even half a million, will be required for evolution to produce a new species of *Homo*. And if the succeeding species of man could perhaps break out of the animal patterns of reproduction, why could not the present species?

Darwin's first reason for believing that efforts at population limitation must be unsuccessful is that countries most successful in this respect would be overrun by countries that continued to multiply. But under modern conditions of restrained migration one country could overrun another only in war. In war, the relative strength of opposing forces depends partly on technological development and partly on the absolute quantity of men and resources available for purposes of war. Both of these factors depend, not merely upon the size of the nation, but on the ratio of useful resources to population. In general, therefore, heavily over-populated nations would be unlikely to overrun nations of similar size and resources that had maintained a favorable balance between resources and population.

According to Darwin, whether population limitation depended upon voluntary or upon compulsory measures, differential reproduction of creeds or sects would favor the multiplication of those that responded most poorly to the controls. Eventually a major portion of the population would habitually ignore the controls that had once been effective. But here again we can look to "natural selection" among nations to maintain progress. Each system of population regulation might break down sooner or later, but whenever a nation thus failed, it would probably fall behind in social or technological progress. World leadership would thus change hands from time to time, from such nations to others that had temporarily solved their population problems. The natural tendency of successful cultures to be widely imitated could thus maintain a rather steady cultural evolution toward a social or political organization of the world that maintained populations near the optimal size in relation to available resources.

Finally, Sir Charles Galton Darwin suggests that if population control should succeed for many thousands of years, a new "procreative instinct" would arise, independent of sexual behavior. It would

spread throughout the population and be gradually intensified by the relatively higher reproduction of those possessing it. Such an instinct would finally break the bonds of both law and culture, and overpopulation would again rule man's destiny.

One of the most obvious trends in human evolution has been the increasing importance of learned behavior. Man's mass conduct is determined by culture at least as much as by instinct, even if instinct is used in a very broad sense. The so-called sexual instinct, for example, is known to find different modes of expression in different cultures, and in some instances comes largely under cultural control. As evidence of this one could cite the wide differences between professional men and laborers with respect to sexual outlets reported by Kinsey. These differences cannot plausibly be explained as biological in origin, but attest to control of the "sexual instinct" by cultural influences.

In short, I have more faith in man's intellectual capacity to evolve and adhere to a profitable creed than in his biological capacity to evolve a new form of instinctive behavior.

That a low reproductive rate can be maintained under natural selection is shown by the reproductive patterns of primates as compared with many lower mammals. Evidence closer to the present discussion is seen in the historical growth of urban as compared with rural populations. Sir Charles Galton Darwin cites this as an effect of high differential reproduction in a segment of the population having a successful way of life. Actually, urbanization tends to sterilize city dwellers, and cities have multiplied in spite of their almost catastrophic biological effects on the people most immediately concerned. Cities bring such great advantages to their culture or nation as a whole, or are an outgrowth of such a successful overall culture, that the surplus rural population is usually sufficient to maintain their numbers. Natural selection has as yet failed to defeat this system and seems rather to favor it. Natural selection is not simply the differential reproduction and survival of individuals; evolution in the genus *Homo* has probably depended as much on competition among populations and their cultures as upon competition among men or families. The essential contest has been primarily one of cultural stability and adaptability, and only secondarily one of numerical strength.

If population limitation should be required for the continued progress of civilization, as many suppose, this cultural pattern, like urbanization, would flourish despite its apparent defiance of the elementary principles of biological succession. If eugenists choose to work for the attainment of an optimal population size and structure in relation to resources, either by increasing or by decreasing birth rates, they will probably find Nature working on their side.

Positive Eugenics

The third promising short-term program of population eugenics would be an attempt to improve the population with respect to psychological and social traits by creation of a *augenic environment*. This would involve, first of all, the improvement of birth control methods and the universal dissemination of information and attitudes favorable to family planning. Second, the proposed system would require the gradual modification of our educational system and our social institutions to place marriage and parenthood high among the interests and goals of the most intelligent and responsive young people. Finally, a eugenic environment would require the reduction of social and economic obstacles to marriage and parenthood by careful reorganization of taxes, salaries and public services. For example, the interference of higher education with early marriage would be minimized, as would the economic conflict between size of family and availability of cultural and educational opportunities.

It is supposed by eugenists that, with

careful study, these changes could be effected in such a way that potentially good parents would be eager to establish families and would have more children, on the average, than other people. According to the "Eugenic Hypothesis," these potentially good parents would also have a higher average genetic potential for intelligence and social adaptability, and would insure a preferential reproduction of desirable genes.

Geneticists are in general agreement that cultural and medical advances do not, in themselves, constitute a permanent substitute for natural selection. Modern eugenists advocate something like the eugenic environment to fill the gap, either with the objective of preventing genetic deterioration of the species or in the hope of improving man's genetic qualities. Such a program might equal natural selection in its effects on intelligence, but we have already noted what slow progress this would be. Of much greater significance, if a workable program of this sort were to be carried through, might be a resulting improvement in the average cultural attainments of the population. For, with each new generation, a larger proportion of children would come from homes that provided a good early social and emotional environment. This would probably occur regardless of the direction or magnitude of concomitant genetic changes so that, for the present, the validity of the "Eugenic Hypothesis" is unimportant.

Further research is hardly necessary to affirm the desirability of some measure of control over population growth. More thorough study is probably needed concerning the advisability of a program of positive eugenics. Only a beginning has been made in exploring the ends desired, the possible means, and all likely consequences.

Endogenous Selection

The three objectives discussed in the preceding sections appear to be the only ones for which useful eugenic measures can be devised in the immediate future. But the original and longer-term objective of eugenics will properly retain an important place in the imagination of many human geneticists. This is the continuation or acceleration of human biological evolution in much the same direction it has taken in the past. I believe that, if man's existence on earth is not brought to a sudden end, propulsion and partial guidance of our evolution by science is almost as certain to eventuate as the conversion of atomic energy to peaceful uses or the improvement of agricultural methods in backward areas. The following review of evolutionary processes seems to indicate that a trend in this direction began long before man invented artificial selection.

Natural selection is essentially the differential multiplication of animal and plant forms according to their degree of adaptation to their environment. This may result simply from differential reproduction, but is commonly dependent upon competition, as for food or for mates. Forms that are brought within man's agricultural economy enter a lively competition for human acceptance, and this is known as artificial selection. In almost every species of animal that has developed any social behavior, there is a similar competition for acceptance by other members of the same species. Sexual selection, in which one sex chooses its mate from several available, is a simple example of this. In bees, defective young and even defective adults are destroyed by normal adults. A positive as well as a negative selection is seen in some birds and mammals living in aggregates and granting privileges according to a social hierarchy. This hierarchy rarely seems to be based on genetic qualities, but the same is true of other instruments of natural selection. Infanticide, often influenced by genetic traits of the infants, appears to have been widely practiced by primitive man for purposes of family limitation (5).

These are examples of *endogenous selection*, if this term is taken to designate any process, other than competition for primary

necessities, by which individuals willfully affect the survival or reproduction of other members of their species. Insofar as endogenous selection causes a species to evolve independently of environmental pressures, this evolution may be regarded as self-propelling or autokinetic. It should be recognized, however, that mechanisms of endogenous selection are themselves subject to natural selection. These principles find their most interesting applications in eugenics.

Endogenous selection survives in Western culture principally as sexual selection, social discrimination, capital punishment, and forced institutionalization. The older expressions of this behavior pattern are gradually being replaced by more rational ones, of which the most recent are public health measures against carriers of some communicable diseases, and genetic counseling. The adoption of public health measures against specified hereditary diseases constitutes the present frontier in the advance of endogenous selection, and the next may be the establishment of a "eugenic environment." In view of the obvious evolutionary advantage of even some crude forms of endogenous selection, it appears likely that natural selection will promote its development up to the most complex form compatible with human society. Although originating as a product of man's ingenuity, systems of selection, like languages, will ultimately be shaped and improved by forces over which man has no conscious control. Progress will be achieved not only by scientific planning, but, more decisively, by competition among nations and the self-elimination of unworkable or inefficient systems; sometimes by gradual overgrowth, sometimes by political or social action, and sometimes, perhaps, by violence. Clearly, these agencies can most effectively insure the continued progress of civilization in a world where diverse political and cultural systems exist side-by-side with liberal exchange of scientific observations but without mutual interference.

When the final history of life on the earth can be written, self-propelled evolution may occupy a position comparable to that of animal locomotion. Both innovations confer greatly increased power and responsibility; the latter an individual responsibility, the former a collective one. Both will have been first achieved by the most complex organisms of their era, but by opening new evolutionary channels will have led to infinitely greater complexity in the resulting biological world.

Conclusions

In the opinion of Sir Charles Galton Darwin, the same average state of human affairs which has existed in the past several millenia will prevail for about a million years to come. In arriving at this prediction Darwin has perhaps confused the behavior of biological systems with that of inorganic systems. In the physical world exceptional events and extreme fluctuations tend to cancel one another, but in biological or cultural evolution they constitute the stepping stones for new advances. In predicting evolution, therefore, one must consider future events which have small individual probabilities, but which would all lead to one result; the sum of their probabilities may be large enough to render their common result almost inevitable. In particular, it might be highly improbable that population growth or human evolution should come under scientific control at any one time in any one nation, but if it occurs just once, this will probably suffice to establish such control throughout civilization for the remainder of human history. Once instituted in a stable society, eugenic measures would lend themselves to limitless improvement, eventually achieving rapid genetic advances with minimal external controls. At present, however, the effects of positive eugenics upon man's genetic inheritance would be inconsequential by comparison with its possible benefits to his cultural heritage. In the coming century, the greatest benefit of all may be expected to derive from better management of popu-

lation problems and from the reduction in incidence of certain hereditary diseases. Ultimately, these four objectives may be pursued in a single, comprehensive eugenic program, varying from one country to another according to different theories and different needs.

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1955 SUMMER WORKSHOP

POPULATION REFERENCE BUREAU

Six graduate students from the fields of demography, sociology, conservation, economics and geography will be chosen for a six-weeks' Summer Workshop in Washington, D. C. in the summer of 1955.

Objective—As the problems of population inevitably gain in momentum, it will devolve upon future generations to interpret population dynamics and to formulate rational policies. The Bureau, through its Summer Workshop, enables the interested student to broaden his field of inquiry and to become more cognizant of population dynamics. It stimulates his thinking in terms of policy.

A diversified educational experience has been planned for Workshop participants. Briefly it will follow the pattern outlined below.

Research—Under the supervision of the Bureau's Director, each student will undertake a research project scheduled for early discussion in the *Population Bulletin.* He will search out the facts, prepare a discussion outline, and finally a first-draft manuscript.

Discussion—Representatives of various government and non-government agencies working in the fields of demography, conservation, and economics and representatives of press and radio will be invited to participate in three or four seminars.

Process Level Experience—Students will learn how the *Population Bulletin* is created by participating in all steps of preparation of an issue: work conferences; research; development of manuscript, tables, charts; preparation of manuscript for printer, handling of proof, preparation of dummy; and finally, distribution.

Summing Up—In termination, each member of the Workshop will prepare for the Bureau a brief statement summarizing:

1. Whether or not the experience was of value to him; if so, in what way; if not, why.
2. Suggestions and comments which would be helpful in planning and conducting future Workshops.

PERCEIVED DIFFERENCES AMONG TWINS

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SINCE MONOZYGOTIC TWINS ARE IN GENERAL more similar than dizygotics, the margin of difference in similarity has often been used as an indicator of genetic influence. Thus, if monozygotic pairs correlate .90 in variable X and .60 in a measure of Y, and if dizygotics correlate .60 in each of these characteristics, at least tentative inferences may be drawn as to the greater importance of hereditary factors in determining individual differences in X.

Attempts have been made to use such correlation data for precise estimates of the relative weight of genetic and environmental factors (2); current theory, however, is no longer oriented toward quantitative research on "proportional contributions." In the case of twins, a given degree of similarity may express an unknown mixture of common hereditary and common environmental factors, and the inference that the greater similarity of monozygotics is wholly due to *direct* genetic effects disregards the possibility that these twins have not only a more similar heredity but also a more similar environment.

The present study is concerned with general aspects of this problem with reference to the social environment, and involves a statistical re-analysis of data for 100 members of twin pairs, previously studied (4) at the Institute of Child Welfare, University of California. Twenty-five pairs of monozygotic twins were compared with 25 same-sex dizygotes falling within the same range as to grade in school, and social status (occupational rating) of the father.[1] Nine pairs of each type were males, 16 were females. The majority of the cases (15 pairs of each type) were in the age range 10 to 14 years. Three of each type were between 6 and 10 years, and 7 between 14 and 18 years. All cases were located in a survey of twins in a normal public school population (8).

We are concerned here with the behavioral similarities of twins, as perceived by their mothers. Attention will be directed to the extent to which mothers differentiate twins in specific aspects of behavior. It is assumed that perceptual differentiation implies different social reputations, which may be not merely an outcome of behavior differences but to some degree a determinant of continuing differences.

Each mother was interviewed by a staff member[2] who attempted to elicit a free discussion of the twins which might serve as a basis for later personality studies. In the course of the interview, a specific judgment was obtained for each of 18 traits, as to whether or not the twins showed a perceived difference. The form of the question, at this point, was designed to bring out even slight differences: "Which one does the more talking?" "Which one usually takes the lead?" "Which one is better at taking a joke?" etc. Some mothers were sufficiently discriminating to state their judg-

[1]The diagnosis of twin types was based on six of Newman's (6) criteria: monozygotic twins must be similar in general appearance; essentially identical in hair color, texture and form; have the same shade of eye color and form of iris; have the same skin color and texture (except for differences due to tanning); show no marked differences in features, shape of ears, or shape, size and arrangement of teeth; have hands of the same type, nearly equal in size.

[2]Virginia Currie, P. T. Wilson.

ments in terms of specific situations — "Jack is more talkative with other children, but Jim seems to do more of the talking when adults are around."

In general it was not found to be feasible, in a first interview, to force decisions in terms of numerous concretely described stimulus-response units. This is not necessarily a defect of the inquiry, since our primary purpose was to obtain global estimates which, if different for the two twins, might operate as different stereotypes. In a few instances the mother's report on a specific trait was inconsistent or uninterpretable, and was not used.

Following are the specific questions included in each interview:

1. Sympathy — "Which one would you say is the more sympathetic?"
2. Perseverance—"Which has the more perseverance, the more stick-to-itiveness?"
3. Attention—"Which one is the more attentive and alert?"
4. Promptness — "Which one is more punctual and more prompt in carrying out requests?"
5. Self-assertion — "Which one is the more self-assertive, the more forward?"
6. Talkativeness — "Which one does the more talking?"
7. Self-consciousness — "Which one is the more self-conscious — more inclined to be shy and bashful?"
8. Memory—"Which one has the better memory?"
9. Sense of responsibility — "Which one shows the greater sense of responsibility?"
10. Sense of humor — "Which one is better at taking a joke?"
11. Irritability—"Which one is the less irritable—the less quick tempered?"
12. Sociability — "Which child is the more interested in playing with other children?"
13. Inventiveness — "Which child has the better imagination? Which one is the more inventive in games and make-believe?"
14. Leadership — "Which one usually takes the lead?"
15. Social adaptability — "Which one gets along better with the other children?"
16. Athletic interests — "Which one is the more interested in athletic games and sports?"
17. Dependence on each other—"Which one is the more dependent on the other, for assistance or companionship?"
18. Impulsiveness — "Which one is the more impulsive—makes up his mind quicker or acts more suddenly?"

Some additional questions, dealing with differences in "preference for parents," "dependence on parents" and other characteristics such as "obstinacy" were also included in the first few interviews, but were dropped from the schedule when they were found to present difficulties in the initial interview.

Ranked according to degree of similarity, Table 1 gives for each trait the number and per cent of monozygotic twins for whom differences were reported. In the last column percentages are converted into sigma values, based on tables for $\frac{x}{\sigma}$.

A wide variation may be noted among these traits, in the frequency of intra-pair differences. These monozygotic twins are apparently not easily differentiated in such traits as inventiveness, memory or promptness, or in sociability or athletic interests. But perceptible differences are noted, more often than not, in impulsiveness and in leadership. The range of trait differences might be interpreted in terms of marked or little susceptibility to environmental differentia, within this twin population. The trait differences, however, cannot be taken at their face value, since they are probably affected by the variability of traits in individuals. Thus, a trait may have very limited dispersion because environmental factors have enforced a social norm in its expression (e.g., athletic interests). In such a case few intra-pair differences will be noted, because the mothers cannot discriminate the relevant cues, or cannot assess them reliably.

TABLE 1

MONOZYGOTIC TWINS

			Pairs with Reported Intra-pair Differences		
		No. of Pairs	*No.*	%	$\frac{x}{\sigma}$
1	Sociability	25	2	8	—1.41
2	Inventiveness	24	3	12.5	—1.15
3	Memory	24	4	16.6	— .97
4	Promptness	25	5	20	— .84
5	Athletic interests	24	6	25	— .68
6	Dependence on each other	23	10	43.5	— .17
7	Attention	23	10	43.5	— .17
8	Self-consciousness	25	11	44	— .15
9	Sympathy	24	11	45.7	— .11
10	Self assertion	25	12	48	— .05
11	Social adaptability	24	12	50	.00
12	Sense of responsibility	25	13	52	.05
13	Perseverance	25	14	56	.15
14	Talkativeness	25	14	56	.15
15	Irritability	25	14	56	.15
16	Sense of humor	24	14	58.3	.21
17	Impulsiveness	25	17	68	.47
18	Leadership	24	18	75	.68

TABLE 2

DIZYGOTIC TWINS

			Pairs with Reported Intra-pair Differences		
		No. of Pairs	*No.*	%	$\frac{x}{\sigma}$
1	Sociability	25	4	16	—1.00
2	Dependence on each other	22	5	22.7	— .75
3	Inventiveness	25	6	24	— .71
4	Athletic interests	24	10	41.7	— .21
5	Sense of humor	24	12	50	.00
6	Memory	24	12	50	.00
7	Sympathy	22	12	54.5	.11
8	Social adaptability	22	12	54.5	.11
9	Perseverance	24	14	58.3	.21
10	Promptness	23	14	60.9	.28
11	Leadership	24	15	62.5	.32
12	Talkativeness	25	16	64	.36
13	Self assertion	24	16	66.7	.43
14	Impulsiveness	25	17	68	.47
15	Self-consciousness	24	17	70.8	.55
16	Sense of responsibility	22	16	72.7	.61
17	Irritability	22	17	77.3	.75
18	Attention	24	20	83.3	.97

To deal with such problems, it is obvious that a much more extensive study is needed, with more cases and with a repetition of the interview in order to determine the reliability of judgments. However, our present concern is chiefly in the comparison of results for the two types of twins, under conditions which involve similar limitations on the same traits.

Table 2 presents data for dizygotic twins, in the same form as Table 1, but rank-ordered according to the frequency of differences in this second group.[3]

[3]A tendency may be noted for traits to show similar intra-pair differences in the two populations, but with some marked displacements in the rank-order. Rho is .60, significant at the .01 level. The use of correlation is open to question, since the number of pairs involved varies slightly in the different traits.

It can be seen that the mean intra-pair difference tends to be somewhat higher in the second group. In Table 1, the mean per cent is 43.2, in Table 2, 55.5 per cent. Among the dizygotics, the most commonly perceived differences are in attention, irritability, and responsibility. Sociability, inventiveness, and athletic interests are among the five traits with the fewest intra-pair differences, for both types of twins.

A more detailed comparison is given in Table 3, which presents the traits in a rank-order according to the degree to which dizygotic differences exceed the monozygotic. The dizygotics show greater intra-pair differences in 14 of the 18 traits, but the second-order difference is significant for only the first four traits. Three out of five of the dizygotic pairs, and only one out of five of the monozygotics, show differences in reported "promptness." In the traits of "attention" and "memory," reported differences are two to three times more frequent among the dizygotics. These are characteristics which may provide a better objective basis for comparison than in the case of some of the traits lower in the list, such as "impulsiveness." The first three characteristics are also related to intelligence, and the results obtained are congruent with the well-known tendency for twin correlations in IQ to be higher among monozygotic twins (3, p. 674). Moderate second-order differences occur for such personal traits as irritability, responsibility and self-assertion, and very little difference for such social traits as adaptability and sense of humor.

Some interest attaches to the fact that in dependence on each other and in leadership the monozygotics, reversing the usual rule, show greater obtained differences than the dizygotics. The hypothesis may be offered that the closeness of relationship among the monozygotics is a factor which promotes greater similarity in interests, attitudes and activities, but at the same time a greater differentiation of their mutual social roles. This may be less often true among dizygotics, whose social activities more frequently lead them into different groups.

Summary

1. Twenty-five pairs of monozygotic twins were compared with 25 pairs of same-sex dizygotics, controlled with regard to age, sex, and social and educational status.

TABLE 3

SECOND-ORDER DIFFERENCES

		% (2-1)*	x̄ / σ (2-1)*	t	Significance Level
1	Promptness	40.9	1.12	3.16	.01
2	Attention	39.8	1.14	3.10	.01
3	Memory	33.4	.97	2.63	.01
4	Self-consciousness	26.8	.70	1.97	.05
5	Irritability	21.3	.60	1.59	
6	Sense of responsibility	20.7	.56	1.50	
7	Self assertion	18.7	.48		
8	Athletic interests	16.7	.47		
9	Inventiveness	11.5	.44		
10	Sociability	8.0	.41		
11	Sympathy	8.8	.22		
12	Talkativeness	8.8	.21		
13	Social adaptability	4.5	.11		
14	Perseverance	2.3	.06		
15	Impulsiveness	0.0	.00		
16	Sense of humor	— 8.3	—.21		
17	Leadership	—12.5	—.36		
18	Dependence on each other	—20.8	—.58		

*The differences are between values in Table 2 minus the corresponding values in Table 1.

2. Through interviews with their mothers, information was obtained concerning perceived intra-pair differences in 18 reputation traits. The data are based on a standard series of open-ended interview items.
3. Among monozygotics, the percentage of pairs reported as different ranged in different traits from 8 to 75 per cent, with an average frequency of 43.2. Among same-sex dizygotics, the corresponding values ranged from 16 to 83, with a mean of 55.5.
4. On individual traits significant differences (*i.e.*, significantly greater disparity among dizygotics than among monozygotics) were for the most part restricted to traits related to intelligence, in this particular selection of traits.
5. On social characteristics such as sociability, social adaptability, etc., little evidence was found for greater similarity among the monozygotics.
6. Although greater intra-pair differences were found among dizygotics in 14 out of 18 traits, the rank-order of these differences is in general similar in the two types of twins. Factors contributing to this similarity are discussed.

Conclusion

With reference to the initial problem of this study, evidence is shown that monozygotic twins tend to be more often perceived as alike in reputation traits. This greater similarity, however, applies very unequally to different traits. For present purposes, we are less concerned with the source of these patterned similarities than with their potential effect, namely, an environmental stereotyping which may tend to be somewhat greater within monozygotic than within dizygotic twin pairs.

This calls in question the assumptions which have sometimes been made (1, 2, 5, 7) that the "average nurture difference" is the same for the two types of twins. If the monozygotic, more than the dizygotic, develop in an environment which recognizes and expects greater similarity in behavioral traits, this may be a fact of some importance (differentially for different traits) in maintaining or increasing their similarity. Emphasis on this point is less needed now than was the case in earlier studies, but we must continue research in this area if we are to define the detailed operation of the stereotyping process where it occurs.

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SOURCES OF GREAT MEN

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CIVILIZATION'S ADVANCEMENT HAS BEEN accelerated in several ways: by the increased use of local natural resources of all sorts, notably of the soil, minerals and fuels; by using the resources of an ever larger share of the earth; by increasing the productivity of individual men and women through education and better health, and by making it possible for them to be productive for a larger fraction of the time. Progress has also been aided by the increase in the number of productive people as, obviously, a large number of workers can accomplish more than can a small number. Undoubtedly a major cause of progress has been the discoveries, inventions and other contributions made by exceptionally talented people. Indeed many thoughtful people declare that civilization's most valuable resource is the people who contribute notably of new ideas and stimulation. Consider, and refute if you can, the following three declarations:

> "The most creative one-tenth of the men are 1000 times as valuable as the average tenth, and more than 1,000,000 times as valuable as the least productive tenth."
> "The productivity of nearly every worker is vastly increased as a result of discoveries made by a very small fraction of the people who have ever lived."
> "The constructive contributions of a small fraction of one per cent of the total world population have made possible civilization's advances."

Leadership has been so highly significant that a discussion of its distribution and mention of various conditions which have correlated with its presence is an appropriate subject of an article.

Of the many sorts of leaders, consideration is given here to three: those of world renown; Americans who have won national recognition; and "local leaders," highly significant in their communities although not widely known. Of the latter type, the mothers of sons who later became renowned are perhaps most precious, according to the testimonials given by many famous men. Because information concerning this third group of leaders is quite inadequate, most of this article is devoted to the other two great groups.

The 1000 most eminent men and women of all history here considered are those who received extended biographical sketches in leading British, French, German, and American encyclopedias. Of the second great group, the Americans, three categories are considered; the 1000 most distinguished, the approximately 2500 scientists selected by secret vote of their fellow scientists as especially distinguished, and starred in one or more of seven editions of "American Men of Science" (starring done 1903–1943); the 30,000 or so American-born persons sketched in "Who's Who in America," 1920–1945.

Here the distribution of the birthplaces for the most world-renowned group is discussed rather broadly, by latitude, by large sections of the world, and by century of birth. For the American notables, some details are given, especially concerning the distinguished scientists, who have been the subject of a sizable volume. Still more detailed studies of notables born in the Midwest are presented in "Geography of American Notables" and in "Indiana Scientists." These three volumes are by the

present writer. The late J. McKeen Cattell, long professor at Columbia University, laboriously compiled 50 years ago a list of the 1,000 most eminent people of all time, and also studied extensively 1,000 distinguished American scientists. Much information concerning the 1,000 most eminent people of the world's history has been more recently assembled by Walter G. Bowerman. The late Ellsworth Huntington of Yale University made extended studies of eminent people of America and of the rest of the world.

Of the 1,000 most eminent people of all time, six interesting generalizations as to their birthplace can be made:

1. Only five of the 1,000 were born between the Tropics of Cancer and Capricorn, although that area presumably contained more than one-fifth of the world's population until recent generations. Born within the tropics were Kipling (in Bombay, India), Mohammed (in Mecca, Arabia), Bolivar (in Caracas, Venezuela), Alexander Hamilton and J. J. Audubon (in the West Indies). (Buddha, Gandhi, and Tulsi Das were born in northern India, beyond the Tropics.)

2. Of those born in ancient or medieval times, relatively many were born in a fairly mild climate, about 160 near the Mediterranean Sea. More recently, most were born in a relatively cool climate: nearly 400 in the British Isles, 260 in Germany, Holland, Scandinavia, etc., 120 in France, 20 in Russia and Poland, 108 in the U. S.

3. Areas which were the birthplace of several notables yielded diverse sorts; for example, authors, artists, and statesmen.

4. Regions which produced relatively numerous leaders at one period may have produced few or none at a later period. For example, nearly all the famous people born on the lands bordering the eastern Mediterranean Sea (Greece, Egypt, and southwestern Asia) were ancients. Of the 44 especially famous people from Greece, only 2 are later than the 4th century A.D. Italy had two periods of considerable productivity, an ancient one, and one commencing about 1200 A.D., but nearly ending by 1700 A.D. Of the 102 from Italy, only 12 came from the 18th or 19th century. In recent centuries, western Europe (notably the British Isles) has been relatively productive. In France, all of the 128 except 15 were born after 1500 A.D. In the United States, New England, Virginia, and Carolina were more productive prior to 1800 than in recent decades.

The westward and northward shift in the productivity of leadership is associated with the depletion of resources of soil and minerals, and possibly with a change in climate. Apparently southern Europe formerly had a more desirable climate than now, and northern Europe, a poorer one. Clearly, as civilization advanced, man became better able to live in cooler climates. Significant also was the shift in Europe in opportunities for commerce and industrialization. After the discovery of the New World, Europe "faced the Atlantic" instead of the Mediterranean. Moreover, the greater deposits of coal and iron in the North than in the South favored industrialization in the North. In China and India, the decline in productivity of outstanding people may have been partly associated with increasing poverty. E. V. McCollum, the distinguished physiologist, pointed out that, after the populous part of China became so densely peopled that few cows were kept and very few children had cows' milk, China almost ceased yielding inventive people and leaders of other sorts. Deterioration in the average quality of the people presumably occurred also in various other areas. For example, in ancient Greece, most of the intellectuals considered it undesirable to marry one's intellectual equal and not worthwhile to carefully rear a sizable family. In Italy, also, the individual's personal achievements were rated important rather than offspring who might be qualified to advance civilization. In New England, the decline in the production of eminent people per million of population reflects a

sharp decline in the birth rate of the Yankees since about 1800 and also the immigration of many "lower class" people, including French Canadians of peasant ancestry, Portuguese, and humble Irish. Significant also was the migration westward of many ambitious Yankees.

5. A predominant share of the famous people of the world were born in or near cities. The most notable exceptions to this generalization were in the U. S. and Canada when many "city people" were "homesteading" or otherwise settling new land, especially in upstate New York, Ontario, the Midwest, and West.

6. Most of the world's famous people were reared in communities where their special talents were appreciated by at least some people, and where their development was encouraged in various ways. Conversely, a large share of the exceptionally talented people, "geniuses," born in unfavorable communities have been killed or otherwise prevented from rising to the heights of which they were capable.

Studies of the place of birth have been made of numerous famous Frenchmen by Odin, and of many famous British by Havelock Ellis. Odin found that Paris and vicinity had yielded relatively many eminent Frenchmen, and Ellis found East Anglia (north of London) to have been the most productive part of Britain.

Of distinguished Americans, there have been several studies. "Dictionary of American Biography," (21 volumes, 1926–1936), sponsored by the American Council of Learned Societies, includes sketches of 13,633 rather carefully selected men and women; "Who's Who in America," biennial since 1899, has sketched more than 50,000 prominent Americans; "Webster's Biographical Dictionary," 1943, sketches about 5,000 Americans and about 35,000 other prominent people.

The most comprehensive analysis yet made of the 1,000 Americans selected as the most eminent is by Walter G. Bowerman: "Studies in Genius," 1947. His selection is of those sketched at length in "Dictionary of American Biography." He reports four chief centers or "foci" of origin: New England, New York, Virginia, and Carolina. Of these, the Carolina focus was least productive and declined earliest; the Virginia focus was highly significant before 1800 and yielded some of the most distinguished Americans. The New England focus has been much the most productive; indeed, a large share of the distinguished Americans are of at least half Yankee ancestry. This includes many born in New York, Ohio, and elsewhere in the Midwest, in the West, and even in the South. The New York focus has gained progressively in importance partly because of immigrants from Germany and Poland, etc., especially those of Jewish ancestry, as many Jews have become prominent.

Of the nation's 33 presidents, 8 came from Virginia, 7 from Ohio, 5 from New England, and 4 from New York. Only 4 came from farther west than Ohio; namely, Lincoln (Ky.), Hoover (Ia.), Truman (Mo.), and Eisenhower (Tex.); only 3 came from south of Virginia, namely Johnson and Polk (N. C.) and Jackson (S. C.). The remaining 2 came from Pennsylvania and New Jersey. When backgrounds are considered, New England led.

Of generals, the South has yielded relatively many. Of inventors, the northeastern states have been most productive. Most prominent businessmen have come from towns or small cities, not from large cities or farms, or from the South. Of millionaires, the yield in proportion to population is largest in the Rocky Mountain states, smallest in the South.

Many prominent labor leaders have been foreign born. Of those born in the U. S., the yield in proportion to population has been largest in the Pacific States, smallest in New England. Native distinguished musicians are few. New York City yielded 5 of the 7 most famous, and also a large share of the concert musicians. Of 27 persons prominent in art, 7 were born in New York

City, 2 each in Chicago and Philadelphia, 5 in lesser cities, 11 in towns; only one was born in the South (Ky.), and only one farther west than Kansas.

Of 235 native Americans recently especially prominent on the stage, screen, or radio, 60 were born in New York City, 10 in Chicago, 8 in Philadelphia, 7 in Los Angeles, 5 in Pittsburgh, 5 in Boston, 4 in Washington, D. C., 3 in Salt Lake City, 2 in San Francisco, and 2 in Helena, Montana. New York State yielded 70; New England, 16; The Rocky Mountain States, 12; California, 14; Illinois, 14; Ohio, 12; Missouri, 9; Wisconsin, 8; Texas, 6; Nebraska, Indiana, Georgia, Virginia, each 4. The South's total is 25, or less than a fifth of its ratio in proportion to population.

Writers of distinction formerly came largely from New England and New York; then for a few decades, considerable numbers came from the eastern Midwest, notably Indiana. In recent years, however, successful writers have been less localized, and the South has yielded them at a rate not very far below its proportionate share of the nation's population.

Of distinguished scientists, there is, in proportion to population, an almost steady southward decline in yield state by state. Formerly, New England led by a wide margin. However, of the younger scientists, the Midwest and Far West have done relatively well, and the South has improved its low yield.

Some Theories on the Localization of Birthplaces

Four popular theories to explain the great contrasts in the yield of notable people in proportion to population are: (1) Rough land produces few leaders. (2) Rich soil yields relatively many leaders. (3) Climatic differences correlate with yield of leaders. (4) As wealth increases, so does the yield of notables.

Tests of these theories made by detailed studies reveal that topography and soil sometimes clearly are significant factors. For example, most of the notables from Kentucky were born in the relatively fertile Blue Grass region, or in the larger cities along the Ohio River, and most of those of Tennessee came from the fertile Nashville basin. Moreover, the most hilly parts of most states were the birthplaces of relatively few notables. However, in most states, the sections which are most level and fertile were not the most productive of leaders. Climatic contrasts are entirely inadequate to explain the yield of leaders, although they almost certainly help to explain some of the contrasts between warmer and colder regions. In milder climates, a larger share of the population generally is of the "easy-going" type than is true in more difficult, colder ones. Hence, in proportion to population, outstanding people are less rare in our North than in our South.

What are the comparative advantages of farm, village, town and city? Many of the earlier famous Americans were rural born because, until recently, nearly all Americans were rural. In proportion to their population, farms and villages have yielded far fewer notables than have towns and cities. County seats, especially those which contained colleges, did exceptionally well, as did choice residential districts or suburbs of large cities.

Numerous studies clearly indicate that the character of the local community is highly significant in the development of leaders. It is essential that mental ability and physical stamina be inherited, but the fact that many well-endowed people fail to become distinguished proves that more than an excellent endowment is necessary. It is certain that proper encouragement is essential. This includes active appreciation by someone deeply respected, of one's qualifications to attain renown in a particular field of special personal interest. Verbal encouragement must be supplemented by opportunity to develop and to serve as a leader. Practically everyone who has attained distinction has done so with the aid of active encouragement.

Good communities are important in the production of leaders partly because they contain some people able to aid, with encouragement, example, and opportunities, promising young people to develop. A good "home background" is important because therefrom one obtains not only biological inheritance but cultural inheritance. Nearly all who have become famous have had at least one parent far above average in ability, vision, vitality, and courage.

The correlation between type of place of birth and yield of notables apparently is far greater than that between yield and topography, soil, climate, material resources, or age of settlement. It apparently reflects the relative attractions of certain types of places for the notables.

Occupational groups must be considered in this connection. What are their contrasts in the yield of notables? Data were obtained by questionnaire from many scientists and subjects of "Who's Who in America" as to the occupations of their fathers. As to starred scientists, information was also obtained as to the occupations of grandfathers. The replies reveal that in proportion to their numbers in the population according to the census nearest the birth of the average notable, professional men fathered more than twice as many notables as did business men, nearly 20 times as many as did farmers, about 45 times as many as did skilled laborers, and more than 1,000 times as many as did unskilled laborers. Farmers fathered one-fourth fewer than their share. In other words, only one unskilled laborer in about 38,000 fathered a son or daughter sufficiently noteworthy to win a place in "Who's Who"; one skilled laborer in 13,000 had that distinction; one business man in 62; one professional man in 27; and one Protestant clergyman in 15.

Why Do Few Homes Yield Leaders?

It is therefore apparent that a small portion of the men fathered a large share of the leaders. The interpretation of this concentration is in dispute. Advocates of the theory that environmental influences dominate assert that the people that produced more leaders did so because they afforded their children better opportunities for development. Conversely, advocates of the theory that hereditary influences are predominant declare that children of unskilled laborers, when adopted into homes of professional men or otherwise given comparable opportunities, nearly always fail to become leaders. They likewise declare that the superior economic status of the fathers of most leaders is the result of their superior qualities of mental alertness, earnestness, ambition, and vitality.

Advocates of the theory that social selection is very important find much support in such data as are here summarized. They point out that the mentally alert people are found chiefly in occupations where their mentality is most advantageous, while the mentally dull are found chiefly in occupations calling for physical strength or routine work. Social selection of another type is illustrated by immigrants of exceptional ability. For example, many eminent Americans are German descendants, especially of the liberals who came soon after the unsuccessful revolution of 1848, or else they are Jewish. Scotland, both directly and via north Ireland (the Scotch-Irish), also has supplied many ancestors of eminent Americans. But according to much evidence, by far the largest group of American leaders are descendants of emigrants from East Anglia, England, the district which has yielded many eminent British, as well as the ancestors of most of the Puritans of New England, of most Quakers, and of the Cavaliers of Virginia. The westward spread of the descendants of these immigrants clearly helps to explain the American geographical contrasts in the yield of notables. Conversely, their partial submergence numerically in various areas by less productive stocks largely produced the subsequent decline in the per capita yield of notables in those areas.

Another theory is that outstanding leaders come from families that are especially alert, earnest, and ambitious, without respect to their ethnic or national backgrounds, and that such people tend to congregate in places of comparative opportunity for them to use their talents. There are many bits of evidence which support this theory.

Another evidence of the selective migration of the parents of notables is that relatively many distinguished Americans were born in county seats, the local centers of greatest opportunity for talent. The considerable number born in college towns is another evidence.

Another theory is that, from young people with the requisite ability, leaders come if they receive adequate encouragement from those close to them and from stimulating teachers, provided opportunities are afforded to them to develop their talents.

Some Tentative Conclusions

The areas most productive of notables at least in America are those which contain the most mentally alert, ambitious, persistent, and energetic people possessed of high ideals. Such people seek opportunities to use their abilities; they appreciate congenial associates and therefore congregate in desirable towns and in choice residential districts or in suburbs.

A region comparatively poor in resources comes, in time, to be peopled largely with those who are deficient in ambition; the more favored areas attract people possessing relatively large amounts of resourcefulness and energy. Notables and their parents are exceptionally mobile, alert to better their opportunities.

Men and women of distinction are a product of both environment and heredity, certainly not predominantly of one of these. It is essential that certain physical and mental qualifications be contributed by heredity. But numerous persons who possess the biological potentialities fail to become distinguished because of unfavorable environmental conditions.

Of great consequence in a youth's choice of a vocation is encouragement from one or more persons whom he deeply respects. Such encouragement may change the direction of his life. Stimulating teachers in high school and college are often highly significant, as are other highly respected people. Important also are the opportunities for able and earnest young people.

Of the many environmental influences which contribute greatly to the development of leaders, some of the most important are those of the home and community. A person receives from his parents and other ancestors influences which affect his development in numerous subtle ways. The family and community influences combined are vitally important. Hence, in order to increase the number of creatively productive people, there is needed an increase in the number of children born and reared in families potentially able to contribute superior qualities both genetically and culturally. One of the ways of bringing about such an increase is to make it more widely realized that such homes are vitally important and that decadence is inevitable if the rearing of the next generation of children is left largely to those who are not well qualified both biologically and culturally. There obviously is dire need already for better comprehension, broader vision, more willingness to serve unselfishly, and more stamina. Very few people with these qualities come from families that are poorly qualified biologically and culturally.

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Family Life Division

PSYCHIATRY AND MARITAL PROBLEMS

Mental Health Implications*

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PSYCHIATRIC RESOURCES IN THE UNITED States are heavily overburdened with severely mentally ill, psychoneurotics and alcoholics. Thousands cannot obtain treatment because suitable institutions and experienced medical and nursing personnel are unavailable or overly costly. For these reasons all avenues to the prevention of mental ill-health in the United States are being explored and new approaches to the development of personal competence are being subjected to experiment.

Customs concerning marriage and family living are embedded in the social, religious, and legal institutions of different nations. The rate at which these vastly different customs reflect cultural change has been greatly accelerated in many sections of the world recently by the advent of mechanization, communication, scientific discovery and the impact of war. Innumerable situations and myriad ways may be observed in which resultant stress and anxiety are reflected in the daily functioning of men and women. The mental health of the individual is influenced by his adjustment to himself physiologically and psychologically, and his adjustment to persons intimately related to him and his environment. Experience leads many physicians to conclude that symptoms of disturbances in their patients become modified in proportion to the satisfaction or frustration inherent in the interpersonal relations between the disturbed person and his closest family members: parents and children, husband or wife.

The innate complexities of the psychic attributes of the human organism have been subjected in Western culture to only the early stages of rigorous scientific scrutiny. Currently in the United States members of different professions, primarily the physician, the clinical psychologist, the social worker, and the minister, have responsibility for assisting persons troubled in their marital relationships. There are varying criteria of how such professional persons can be trained adequately and accredited for work in marital adjustment situations, and there are varying techniques and philosophies concerning how most adequately the person who comes for help may be assisted.

Development of Marriage Counseling in the U. S.

As a result considerable experimentation has ensued in the formalization of efforts to work with adjustment problems and to promote increased personal competence focussed in the marriage relationship. Case studies have been reported and subjected to the scrutiny of an interprofessional group, the American Association of Marriage Counselors,† associated together since 1946. The purpose of this Association is to explore and exchange information concern-

*Paper presented by invitation at Philadelphia Psychiatric Hospital, Jan. 20, 1955, and at the Fourteenth Japan Medical Congress, Kyoto, Japan, April 3, 1955.

†National Headquarters, Room A206, 270 Park Avenue, New York City.

ing the special skills utilized in what has become known as marriage counseling and to promote high professional standards in this field. The membership of this association in 1954 indicated 30 per cent were physicians—of them 11 per cent were gynecologists, 9 per cent psychiatrists, 9 per cent general medicine, 1 per cent urologists—18 per cent educators, 15 per cent were social workers, 13 per cent clinical psychologists, 12 per cent sociologists, 12 per cent ministers.

Some of these members use marriage counseling skills within their private practice, others in hospital clinics, social agencies, university counseling services or centers organized specifically for marriage counseling. There are several hundred such organizations in urban areas in the United States which offer marriage counseling.‡ These are organized under different auspices, primarily medical, educational, religious. All are operated without financial profit, charging nominal fees or no fee payable to the agency. (1)

A Specific Marriage Counseling Service

Third to be initiated in the United States, among services focused entirely on marriage counseling, and related activities, was the Marriage Council of Philadelphia established in 1932 "to help young married couples and those contemplating marriage to a better understanding of what companionship in married life involves, and thus to help them avoid some of the causes of marital difficulties." This agency has always been non profit making, available to anyone, regardless of race, creed, or national origin and sponsored by men and women of recognizedly high professional caliber. It has always employed professionally trained staff, as counselors, primarily social workers with a psychiatrist part time. Its work with clients has been under the supervision of a medical and a legal supervisory committee. In 1950 the Marriage Council was officially affiliated with the School of Medicine, University of Pennsylvania, by becoming the operational unit of a new Division of Family Study of the Department of Psychiatry. (2) It is supported by fees from counseling with individuals and family life education work with groups; grants from private foundations, state and federal funds for training and research. Membership contributions from interested citizens in the community are an important yearly source of revenue.

In 1954 Marriage Council staff saw about one thousand cases yearly, about seven hundred of these being new clients. About nine thousand persons desiring to discuss all aspects of family living met with staff in classes or groups. This is called family-life education. To handle this work in addition to the secretarial staff (5 full time), we have four full-time staff members and seven part-time, and a part-time psychiatric consultant. An interdisciplinary research team of five part-time members is responsible for the research program.

At this point we might well ask ourselves the direct question: What actually is marriage counseling? Marriage counseling is defined as the process through which a professionally trained counselor assists two persons (the engaged or marriage partners) to develop abilities in resolving, to some workable degree, the problems that trouble them in their interpersonal relationships as they move into a marriage, live with it, or (in a small number of instances) move out of it. The focus of the counselor's approach is the relationship between the two people in the marriage rather than, as in psychiatric therapy, the reorganization of the personality structure of the individual. The theoretical framework behind this approach presents the following hypothesis: That, if an individual can experience during the counseling process, new understanding of himself and his marriage partner and more satisfying ways of using himself in his daily relationships in mar-

‡These figures include many of the 260 member agencies of the Family Service Association of America.

riage and with his family he should be able to apply these acquired abilities to other problem situations as these may arise in his daily living.

Marriage requires two persons; therefore it has been our philosophy here, as in many other marriage counseling services in the United States, to make every effort to work with *both husband and wife.* This approach is explained at application and reiterated during counseling. When one partner refuses counseling initially, we start with the partner who desires help and in over 75 per cent of our cases we do have contact with both partners. We experimented in having each partner work with his own individual counselor, scheduling periodic conferences between the two counselors to keep in touch with progress. We found this procedure time consuming and expensive for agency. We also, on the basis of experience, felt it was often confusing and even separating in effect upon the husband and wife. We have routinely, for the last five years or so, scheduled one counselor to work with both the husband and wife. Each partner is seen separately at weekly interviews of approximately 50 minutes each. As part of the intake process and at intervals, *when deemed appropriate by the counselor and each partner,* a joint interview with husband and wife together is held. Phantasy and reality often meet for the clients and the counselor in this three-way conference.

We realize there are special problems of transference and counter transference inherent in one counselor working with both husband and wife. It is necessary for the marriage counselor to have a very real self-awareness of his dual role; his identifications, his biases, his cultural prejudices, his moral, ethical and sexual codes of behavior, his value system as this may affect and be affected by the vagaries and perhaps divergent attitudes and feelings of his two clients. He must clarify at the onset of counseling the confidential nature of his relationship with each partner so that his clients trust his integrity and can discuss their feelings and behavior with freedom and candor knowing that it will not be discussed with the other partner unless he so desires.

By establishing a continuing relationship with each partner the counselor can learn far earlier in the contact, than when working with one partner only, how much the material presented by the client represents projections or reality. When the stories of events experienced together during the week continue to be unrecognizable to the counselor from the reporting of each partner, it becomes obvious that one, or maybe both, are distorting reality. On the other hand when the counselor receives almost identical descriptions of events from each partner over a period of weeks, even tho these partners are at dagger's point, it is apparent that, no matter how difficult the situation, we are dealing with problems and situations which appear to have the same reality for both persons involved. By keeping the focus on those factors in attitudes, feeling, and behavior which precipitate disturbance and suffering from one or both spouses, the counselor is able to discuss with each client early experiences which appear to the client to be sources of his present value system and resulting behavior. Obviously the marriage counselor must recognize the kind of apparently satisfying balance which two individuals, whether "normal" or neurotic, can work out in a marriage. Only if there is dissatisfaction on the part of one or both partners would a couple come for marriage counseling. In such a case emphasis would be on the way the neurotic behavior affects the partner relationship.

Discussion in the area of sexual relations can often be particularly rewarding in terms of understanding certain of the dynamics of the personalities involved and some of the characteristics of their interrelationship. Schedules, initiated in our research program to cover information concerning sexual feelings, attitudes, and be-

havior, are utilized during the counseling session, at the discretion of the counselor. These permit obtaining systematic material from both husband and wife about something presumably jointly experienced. The discrepancies in these reports and the indicated lack of information in the estimates by one partner as to how the other partner thinks and feels give important clues to the emotional overtones and blocks of each person. For example in a marriage in which the clients both recognize a sexual problem based on the husband being desirous of more frequent coitus than the wife, it can be predicted on the basis of our research findings, that the husband will be likely to estimate sex relations as occurring on the average of say once weekly whereas the wife in this same marriage will probably estimate sex relations as occurring three times weekly. The distortion is in the direction of what the individual feels he most resents; the husband exaggerating his deprivation of intercourse, the wife, the amount of his demand. The actual reality is probably somewhere between the two reports (3) (4).

When the same counselor works with both husband and wife, many such examples of the emotional overtones which color and distort the impressions of reality of an interpersonal relationship are apparent. With skill these discrepancies can be discussed, the emotions involved explored and, with the reassuring relationship with the counselor, who often performs the role of the kindly, caring, permissive parent surrogate, the client can risk modifications in his former behavior. As new experience brings more satisfaction and less frustration these risks are consolidated—communication between husband and wife is effected on both a feeling and verbal level and behavior is recognized within a more realistic framework.

In certain cases the counselor suggests that the client supplement the counseling interview by reading material. Sometimes seeing the written word or finding discussion by other thoughtful persons of the subjects under exploration aids the process of assimilation of new ideas, information, and the reorientation of attitudes, feelings, and finally behavior.**

The range of contact with clients in our marriage counseling service is from 1 or 2 interviews with an engaged couple to 50 or more interviews during a year or so with couples who present continuing and difficult problems. The average post marital counseling would run from roughly six to ten sessions of 55 minutes at weekly intervals. These interviews are (of course) face to face and deal primarily with conscious material. When a client becomes more disturbed during these contacts or his needs necessitate exploration of his total personality organization, psychiatric treatment is interpreted to him and a referral is effected whenever possible. During fifteen years the percentage of such referrals has varied from 8 to 15 per cent of total intake. When clients are referred by a psychiatrist or report psychiatric treatment before coming to Marriage Council, we try to obtain their permission to consult the psychiatrist as to the suitability of Marriage Council working with the situation.

We see more women than men, a ratio of about two-thirds to one-third; the majority of our clients are between 20 and 35 years of age, and all religious affiliations are represented, with Protestants leading. Slightly more than half have college or more than college education, the rest some or all of high school. Economically we see primarily a middle-income group with a few extremes

**Books found to be of use to clients include:
"The Happy Family," Levy and Monroe, Alfred Knopf, New York, 1943, $2.75.
"Marriage: The Art of Lasting Love," David R. Mace, Doubleday & Co., N. Y., 1952, $2.75.
"A Marriage Manual," Stone and Stone, Simon and Schuster, New York, 1952, $3.50.
"When You Marry," Duvall and Hill, Association Press, New York, 1945, $3.00.
"Emotional Maturity," Leon J. Saul, J. B. Lippincott, Philadelphia, 1947, $5.00.
"Marriage and Sexual Harmony," Oliver M. Butterfield, Emerson Books, N. Y., 1943, $.50.
"A Sex Guide to Happy Marriage," Edward F. Griffith, M.R.I.S., L.R.C.P., Emerson Books, Inc., N. Y., 1952, $3.00.

at either end. Marriage Council quotes a sliding fee set by the counselor and client together on the basis of the client's income and responsibilities. In 1954 eighty-three per cent of clients paid fees, the average for those paying being approximately $3.66 per office interview ($3.57 for total).

In addition to the individual counseling our Marriage Council and Division of Family Study have accepted responsibility for three other branches of program: teaching medical students, post-graduate training, and research.

Teaching of Medical Students

Three years ago our Division of Family Study offered two electives for senior medical students at the University of Pennsylvania. One course consisted of 16 weekly lectures in Family Attitudes and Sexual Behavior. Ninety-two out of 125 seniors registered for this the first year. The second elective admits a few seniors, (3 to 7) to the clinic yearly as participant observers for a period of six weeks.

The purpose of these two courses, as stated by Dr. Kenneth Appel (5), is to acquaint the senior medical student with the kinds of problems men and women have in marriage, how tensions, anxieties, frustrations, resentments and angers that accompany these conflicts affect the health of the individuals involved and most important, what the medical practitioner can do to be helpful with his conflicted patients himself, or in referral to psychiatry. "We believe," he continues, "that the study of family attitudes, sex behavior, and marriage counseling are important in the practice of medicine because:

1. The doctor is often family advisor in these subjects—is turned to as an expert first and foremost.
2. Much psychosomatic illness has its root in unhealthy interpersonal relationships; in attitudes toward sex and in unhealthy sexual behavior.
3. Family and social ramifications of sexual difficulties result in a great deal of marital unhappiness, divorce and delinquency."

One senior student wrote the following statement after his experience in the six-week elective at the clinic.

> "The art of marriage counseling requires a different approach from that of the science of medicine, but it is an integral part of the art of medicine. Although much of medicine requires the objectivity of science, the importance of interpersonal relationships in the treatment of patients can not be minimized. Every patient has some problems, (large and small) which may at some time be brought to the attention of the physician, isolated or in association with a medical problem. It is of great importance to both the patient and the doctor that the physician be equipped to handle such a situation. Here the approach of the counselor, as an attentive, understanding and sympathetic confidant, is an essential part of the physician's equipment.
>
> The effective physician is a product of his heredity and environment, the whole gamut of interpersonal relationships he has experienced and to which he has responded throughout his lifetime, as well as the technical training in medicine. . . . The practice of marriage counseling does much to reorient the physician in this life-long experience and to integrate the scientific training into the evolution of the good physician."

Post Graduate In-service Training

There are many professional disciplines wherein the need for marriage counseling skill arises. The minister, physician, clinical psychologist, case worker, and family-life educator may all at some time be called upon to render marriage counseling service particularly in smaller communities where there are no established services of this nature or psychiatric resources. However, there are few specific supervised training experiences on the post-graduate level focused on marriage counseling within these various fields. Our training program is not concerned with sending "marriage counselors" as such into communities but rather to prepare professional persons in various fields to use the specialized skills they may learn in a marriage counseling

service, in conjunction with their established profession. In so doing it is our hope that the person should be able (1) to aid in the prevention of future marital difficulties through parent education, young people's discussion groups and individual premarriage counseling, (2) to utilize their acquired skills to judge whether the particular client needs to be referred to another specialized source of help, in particular for psychiatric treatment if it is available, and (3) to counsel on those marital problems which fall within their function and with which they expect to work with a reaonable degree of effectiveness. We believe that marriage counseling is safeguarded and improved when effected under medical or psychiatric supervision and we therefore urge this whenever such facilities are available. The in-service training program at the graduate level has continued at Marriage Council since 1950, the minimum period now being 9 months of half-time work. In addition to the nineteen neuropsychiatric residents, thirty-two persons have completed this program.

Of the total group of thirty-two who have completed their training (twenty-five completed and seven currently training) two are Medical Doctors, three have graduate degrees in Sociology, four in Social Work, four in Clinical Psychology, four in the Ministry and fifteen in Family Life Education (of whom three also have ministerial degrees). Twelve of the specialists in Family Life Education were sent for training by Teachers College, Columbia University, which uses Marriage Council as a field placement for their interdepartmental doctoral major in Family Life Education and Counseling.

Placement For Veterans Administration Neuropsychiatric Residents

In 1947 the Veterans Administration contracted with Marriage Council to be one of the clinics to train their three-year residents in neuropsychiatry. In the subsequent six years (through 1954) 19 residents—all men —have completed a minimum of six months' part-time experience in marriage counseling.

Almost all of these "trainees" keep in touch with us, and we receive a substantial number of requests from different parts of the country to fill positions requiring persons with special experience in marriage counseling. Many of these neuropsychiatric residents have written us that the techniques of marriage counseling are time saving and of considerable usefulness to them in their psychiatric practice and that the concept of working with both partners in a marriage-focused problem has in selected cases worked out with practical effectiveness. Of the twenty-three non-psychiatric personnel, who completed the program in 1954, all are holding positions which utilize their marriage counseling skills in greater or less degree, 11 are employed in marriage counseling services, 5 are in mental hygiene or medical clinics, 4 are teaching in high schools or colleges, 3 are in parish work.

Evaluation of the Results of Marriage Counseling

As we mentioned in the beginning of this paper the psychic attributes of the human organism in Western culture are being subjected to only the early stages of scientific scrutiny. The same limitations hold for objective scrutiny of the processes involved in attempting to help troubled persons with problems of personal or family adjustments. The stresses and strains which precipitate physiological or mental pathology quite naturally vary in different cultures but are inevitable to some degree in all groups. In the process known as marriage counseling, which aims at enabling the upset person to develop more bearable interpersonal relationships, what actually happens within the inner sanctum of the interviewing room is, with few exceptions, a matter of nebulous obscurity to all but the two participators. There is little scien-

tific information available concerning what effect a series of interviews with an analyst, a psychiatrist, a clinical psychologist, a social worker or a marriage counselor actually has on the adjustment of a disturbed individual or on a distorted situation.

In recent years in many countries an appreciable increase in undertaking the assessment of the outcome of such services has been evidenced in most professional disciplines and specialties. It is healthy that a few pioneer scientists have ignited curiosity among the younger practitioners. It is also fortunate that questions are being asked by these newcomers as well as by boards of directors and intelligent laymen which we, although professionally trained and experienced, find it hard to answer. A cultish apathy will furnish little eventual protection from the necessity of proving through scientifically acceptable methods that our hypotheses concerning how people are helped can be subjected to verification and prove their reliability and validity.

An effort in this direction has been undertaken by our Division of Family Study. Under funds from the United States Public Health Service for the last six years we have studied factors affecting marital adjustment and have also attempted to evaluate the results of marriage counseling.

As a beginning our research team published a method of known reliability for recovering information from discursive case records (6). Subsequently an analysis of a sample of case records was made. This included a judgment of the movement of clients during counseling; (improvement or lack of improvement) *i.e.*, "the extent to which the client has increased in decisiveness, has experienced release from tension, has acquired useful information, new techniques or greater understanding, with which he can deal more successfully with his problems, etc. Types of problems brought to counseling, the counseling techniques used, and the effectiveness of these techniques have been analyzed in part and many of these items have been treated statistically." In a group of cases in which both clients and their partners were counseled we found that approximately "5 per cent of the cases showed retrogression, from 25 to 30 per cent showed no movement (improvement) at all, and from 60 to 66 per cent showed positive movement (or improvement)." In studying the various factors affecting movement in counseling we have concluded as follows:

1. "Biographical factors point in the direction which indicates that clients are people rather than statistics. Age, education, and the other bases on which the population is often fractionized seem not to play any essential role in determining movement in counseling.

2. The evidence points strongly in the direction of the fact that the determinants of movement are multiple and complex.

3. There is some evidence to support the view that the setting of a permissive, encouraging atmosphere and relationship is the principally helpful function of the counselor.

4. There is substantial evidence to support the conclusion that, if both marriage partners come for counseling, husbands and wives counseled separately and independently, although usually by the same counselor, move together; that is, if one improves the other improves and if one retrogresses the other retrogresses." (7)

Summary—Mental Health Implications

Certain people are first conscious of extreme disappointment, anger, and emotional disturbance in the daily adjustments of the marriage relationship. Others suffer from physical symptoms, the origin of which cannot be discovered by routine medical examinations. Because in the last decade in the United States popular articles, books, radio, and television programs have emphasized the subject of marriage and family living, many upset or anxious persons will refer themselves or their friends for marriage counseling. The majority of these persons would hesitate at

this stage in their problem to resort to psychiatry. Experience has indicated that nine out of ten such couples who have marital problems and who come for counseling can be treated through counseling and that approximately two-thirds of this group can obtain some degree of relief and can learn methods of resolving their difficulties. The tenth person can usually be aided to accept referral for psychiatric treatment.

Adequate marriage counseling facilities, in which emphasis is on knowing what not to undertake as much as what to undertake, offer services which supplement those of psychiatry. Such facilities deal with troubled persons at incipient stages in their difficulties, or when the difficulties, although of long duration, have not yet produced mental illness. Because marriage counseling contacts are brief compared with average psychiatric contacts, the individual cost is substantially less even when psychiatric supervision is maintained. If 66 per cent of counseled cases show improvement, it appears that marriage counseling can offer a service auxiliary to that of psychiatry toward the mental health of the community.

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BOOK REVIEWS

HUMAN HEREDITY: James V. Neel and William J. Schull, the University of Chicago Press, Chicago, 1954, 361 pp., $6.00.

This is an advanced textbook in human genetics. It is thoroughly oriented toward man. Not only do the authors use almost exclusively human heredity in their examples, but nearly all topics are dealt with in proportion to their importance to man and in terms of data available from human material. By emphasis on principles underlying medical and public health problems, this volume probably does more than any previous book to integrate the fields of genetics and medicine.

Many sections of the book will be of interest to eugenicists. The third chapter emphasizes the vast potentialities of gene-controlled differences between individuals, which are based upon between 20,000 and 40,000 pairs of genes. In the next chapter, on nature and nurture, the authors write, "No biologists will deny the great plasticity of the human mind. Nevertheless, there are clear indications that, in mental as well as physical traits, heredity supplies the raw materials on which environment works, and that the nature of these raw materials differs from one individual to the next."

On pages 80 to 82 there appears a table of 34 hereditary disorders for which normal carriers may be detectable. On a four-point scale of reliability, however, only eight are classed as having well-recognized carrier states. In the ninth chapter, four pages are devoted to the genetics of intelligence. It is of interest that, in listing the theoretical requirements for a foster-child study, the authors cite Osborn's *Preface to Eugenics*. Chapter 11 is devoted entirely to the nature, causes and consequences of mutation in man. The authors conclude that our knowledge about human mutation is so fragmentary that we really have no basis at present for being either worried or complacent about mutations induced by atomic energy devices and x-rays; it is therefore a very important field for further research.

In the chapter on physiological genetics the authors express confidence that medical science can find successful treatments for many hereditary diseases, but these are chiefly diseases in which the defect is mediated through the blood stream. "Where the consequences of a genetic defect are entirely intracellular . . . the opportunities for reversing the defect are more limited."

Chapter 15, on population genetics, deals largely with the geographical distribution of blood groups and the interpretation of these data. At the end the authors say, "It is an obvious fact that man is divided into a number of subgroups which may be termed 'races'. [But] attempts to promulgate and disseminate concepts of the superiority of some groups and the inferiority of others . . . have no standing in the courts of present-day science."

The chapter on twins presents many important statistical and theoretical considerations but is not so carefully done as some other chapters. The last three chapters concern applications of genetic knowledge to man and deal, respectively, with genetic counseling, settlement of disputed parentage, and eugenics. The last is probably the most conservative presentation of the case for eugenics that good geneticists would support, and it is therefore interesting to find such statements as the following:

> "There is an urgent need for more studies like [that on retinoblastoma]. Only from such investigations can the genetic balance sheets be drawn up which permit an accurate evaluation of the results of the present relaxation of natural selection."
>
> ". . . there appears to be, then, ample legal precedent for *compulsory* sterilization, as well as adequate safeguards of the rights of the individual . . ."
>
> "Few would doubt the wisdom of curbing the reproduction of the mentally unbalanced. But the principle involved, once unleashed, has ramifications which touch upon the lives of all of us."

The last sentence is the key to the authors' principal objection to negative eugenics. They contend that healthy carriers of genetic disease contribute as much misery to future generations as do affected persons, and that we all are probably carriers. At this point the reviewer finds himself in disagreement. If the first part of the above contention were true, natural selection would not account for organic evolution. The obvious line to draw in applying negative eugenics is that between the handicapped and the healthy.

Actually, the authors are probably not so at odds with modern eugenics as they seem to be, because many of their arguments are directed against the eugenics movement of twenty years ago. They point to the lessons already learned in eugenics by referring the reader to Madison

Grant's extreme and outdated book, *The Passing of the Great Race*. In contrast, they seem to have some sympathy with the eugenics program set forth by Osborn in *Preface to Eugenics*. However, it is not clear that they themselves understand Osborn's proposals for positive eugenics, and they certainly do not explain them. They say, "But there is also a large group, concerning whose desirability as parents there would at the present time be a very considerable debate, with no two competent geneticists taking precisely the same stand." They fail to point out that the program of positive eugenics envisaged by Osborn requires no decisions on the part of geneticists or any other outsiders as to the fitness of prospective parents. Osborn proposes the creation of a "eugenic environment" in which persons who would make the best parents will be spontaneously motivated to have more than the average number of children.

Neel and Schull raise other objections to eugenic action. Recognizing that "obsessive-compulsive" personality is often associated with creative talent, they write, "Let us assume for the moment that this is an inherited mental attribute. To what extent should this trait be selected for?" Of course, Osborn would not select *for* anything, but it would surely be absurd to select for obsessive-compulsive personality as a substitute for creative talent.

The authors warn that, "Time and again man, in consequence of an insufficient understanding of the factors involved, has contrived to upset nature's balance." If this is an argument against the conservative eugenic program currently envisaged, is it not equally an argument against many well-accepted social measures, whose ultimate effects on the species can never be confidently predicted?

Although the chapter on eugenics cannot be recommended by this reviewer, the book as a whole is an extremely good reference and text. For geneticists and for persons dealing with social, population, or public health problems, it is without doubt the best available reference on the principles of human genetics.

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FINANCING THE COLLEGE EDUCATION OF FACULTY CHILDREN: Francis P. King, Henry Holt and Co., New York, 1954, XII + 115 pp.

This study, conducted by Teachers Insurance and Annuity Association's research associate Dr. King for the Fund for the Advancement of Education (an offshoot of the Ford Foundation), is well done.

It is of interest to readers of *Eugenics Quarterly* for four major reasons: (1) Most college faculty members rank in the top tenth of the population in ability and earnestness; (2) A considerable share of faculty children become outstanding adults; (3) As colleges and universities are a source of a predominant share of future American leaders, the improvement of faculty morale is highly desirable; (4) As professors and those stimulated by them are a major educational force, it is highly desirable that their quality be improved.

The directors of the Fund for Advancement of Education were sufficiently impressed by the findings of this study so that they promptly took steps to aid in the financing of the college education of faculty children. The Teachers Insurance and Annuity Association was especially qualified to carry on this study because since 1918 it has been striving earnestly to improve the lot of college and university personnel.

This volume's chapters are "Advancing higher education through fringe benefits"; "Institutional characteristics and the faculty population"; "Patterns of educating faculty children", and "Other faculty economic problems."

Evidence is presented that college faculty members are seriously underpaid as compared with various other groups, and that their financial status has deteriorated in recent years. Providing faculty children with what they consider as an appropriate college education has become increasingly difficult. Most faculty members interviewed (a considerable part of this study is based on interviews) believe it desirable that their children attend college away from home. Also, it is generally considered undesirable for the children that they go in debt to pay for their education. Relatively few professors are able to easily finance the college education away from home of two or three children. Almost no state-supported schools reduce tuition for faculty children, although a considerable number of private schools do. A few private schools make gifts to their faculty of sums sufficient to pay the tuition of their college-attending children, and permit them to attend another institution.

A Faculty Children's Tuition Exchange, set up in 1950, had 72 participating private colleges by January 1, 1954. Under the provisions of this Exchange, the participating institutions, accept faculty children from other institutions debiting those institutions for their tuition, and sending, in exchange, to other institutions, a like number of faculty children. The project worked so well for the four years tried that the Fund for the Advancement of Education is now

broadening it. One area especially needing some such help is state-supported institutions, which have approximately half of all the college personnel.

Some recommendations of this study are: (1) Additional colleges should be stimulated to remit tuition to children of their faculty members. (2) Investigate the desirability of regional exchanges to supplement the existing, very limited national exchange (72 institutions is a minute fraction of the more than 1500 in the country.) (3) Investigate methods of extending Exchange functions to state-supported institutions, and of developing international faculty children exchanges. (4) Stimulate colleges and individuals to provide special scholarships for faculty children. (Additional loan funds for students is not a clear need.)

This book at many points stresses the desirability of making the teaching profession desirable enough to attract the most able and otherwise worthy young people. Of course aid for educating their children will help.

(A 23-page digest of this volume by its author appears in the A.A.U.P. *Bulletin*, Autumn, 1954, issue.)

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GENETIC HOMEOSTASIS: Michael I. Lerner, John Wiley & Sons, Inc. N.Y., 1954, 134 pp. $3.25.

The ancient adage that "good things come in small packages" is admirably illustrated by I. Michael Lerner's exposition on "Genetic Homeostasis." This is a compact yet dynamic presentation of a comparatively new thesis wherein Lerner suggests that the adaptive superiority enjoyed by heterozygous genotypes (in sexually reproducing organisms), is due to certain homeostatic (self-regulating) properties operating on both the individual and population levels.

Lerner, as a practical population geneticist and animal breeder, is interested in the mechanisms that may promote and preserve the superior adaptive values achieved by well-integrated Mendelian population units during their long course of progressive evolutionary history. Possession of this knowledge, he hopes, will encourage the development of better concepts and practices within the field of animal improvement.

Through the use of genetical models, Lerner attempts to show that a self-regulatory device exists that, in essence, prevents the establishment of certain gene constellations which would lower, in the long run, the vital capacity of a population. He suggests the term "genetic homeostasis" for this phenomenon, defining it as "the tendency of a Mendelian population as a whole to retain its genetic composition arrived at by previous evolutionary history." Not only is Lerner concerned with the concept of population equilibrium in terms of the action of stabilizing selection (rejection of extreme deviants), but he strongly suggests that the adaptive physiological and developmental properties of the individual as well are governed by the same sort of an auto-regulatory system. This protective mechanism, acting on the individual level (developmental homeostasis) enhances phenotypic uniformity, permitting the individual to attain prescribed maturational goals through genetically determined developmental pathways. A breakdown of this auto-regulatory system would mean that an individual could neither compensate nor correct for environmental variations affecting its ontogenetic course of development.

Lerner develops the concept that homeostatic properties, in both the individual and the population, are dependent upon the presence of an "obligate" proportion of heterozygous loci. It is this situation giving rise to a more uniformly adapted phenotype, which, on the population (genetic) and the individual (developmental) levels prevents "excessive reproductive waste." With this mechanical genetic "buffering" system in operation, individuals are "canalized" into optimal pathways of development. It is the heterozygous genotype per se, which is the equilibrating factor, allowing canalization along the normal developmental routes. Lerner shows that homozygous genotypes (perpetuated by certain systems of selective inbreeding frequently followed by animal breeders), are more subject to developmental deviations due to their greater degree of phenotypic variability in regard to traits concerned with the overall "fitness" of the individual, therefore producing what Lerner terms "phenodeviants." Thus the heterozygous genotype, favored by natural selection because of better "buffering," is the underlying mechanism concerned with the maintenance of this homeostatic force, in both the population and the individual. It is, in a sense, the quantity of heterozygosity rather than the quality that is important and Lerner sets up various genetic models illustrating this thesis.

The author suggests to those workers interested in animal improvement that any departure from the natural breeding systems operating to preserve the homeostatic properties of the population essentially will be inimical to their interests or goals. Man, in selecting animals for isolated advantageous traits (e.g., greater milk production and greater weight or size of eggs), is operating in contradiction to

the biological system maintained by natural selective forces. The breeder cannot, by any means, hope to obtain greater maximum yields from his stock without taking into consideration the conservative forces inherent in homeostasis. A breakdown of homeostatic properties in the biological system, especially in cases of rapid artificial selection within a single line, would tend to lower population efficiency with respect to viability or "fitness." However, Lerner states (without indicating how it may be accomplished) that once we learn how to surmount the confining limits of this conservative homeostatic force the breeder then should be able to devote his efforts not so much to the production of superior individuals (developed within biologically inferior populations) but rather to the production of superior populations as a whole, with good prospect for improvement of the selected trait as well.

The author therefore emphasizes that the goal in animal improvement should not be in the direction of intensive selection for advantageous individual traits, for such selection tends to raise the level of homozygosity, decrease the genetic plasticity of the population, and oppose the action of natural selection. Rather, animal breeders should practice a "less intensive selection" which may, in the long run, permit the overall development of better balanced genotypes.

Lerner's book, although orientated to the needs of the animal breeder and population geneticist, nevertheless, although rather obliquely, is also relevent to the interests of the eugenist. In fact, Lerner's ideas are based in part upon Penrose's* suggestions relating to genetical traits concerned with fertility and intelligence in human populations. Penrose claims that the human population is maintaining a well-balanced genetical system in reference to these characters and suggests that any attempt to weed out of our breeding structure that segment of the population which is most fertile, but less adapted for scholastic training, will disturb the genetic stability of the population. It is this less intelligent but highly fertile portion of our population (admittedly at odds with our existing social structure, but rather well integrated biologically) that maintains the reservoir of high-intelligence genes from which the upper segment of the population (*i.e.* high intelligence, low fertility) draws its genic material. It is precisely this "lower intelligence" group (over which much eugenical controversy reigns) that is the normal and essential part of a human breeding system. The presence of this group imparts "genetical stability" (Penrose's term) or "homeostatic properties" (Lerner's term) to the human population as a whole. From such a hypothetical model, as envisioned by Penrose, Lerner develops the concepts elaborated in his book and attempts to suggest this type of thinking as a working hypothesis to the animal breeder.

"Genetic Homeostasis," as a book, with its emphasis on animal breeding would appear to be tangential to the needs of the eugenist. However, genetic homeostasis, as a concept, with its accompanying significance in the realm of degenerative inbreeding from the standpoint of human populations, relates to some crucial problems. With the background gained from Lerner's exposition on this subject, we can possibly visualize that at the population level the human species is not particularly endangered, because with the system or level of inbreeding as practiced in man, the human population will still maintain the requisite proportion of heterozygous loci, providing sufficient protection against population breakdown. As yet we have not tampered to any great extent with the natural homeostatic forces shaping our population structure.

Thus "Genetic Homeostasis," with its mass of interesting and extremely well-documented experimental data including over 250 references mainly from the fields of embryology, insect and rodent genetics, and poultry breeding, offers a very promising theory to investigators in these fields. However, as it assumes great familiarity with many specialized genetic concepts, it is recommended chiefly to advanced workers within these disciplines. In view of the wealth of material offered, it is quite suprising to note the omission of an index, which may tend to hamper its use as a valuable source book.

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*Penrose, L. S. The supposed threat of declining intelligence. *Am. J. Mental Deficiency*, **53**: 114-118, 1948; and Genetical influences on the intelligence level of the population. *Brit. J. Psychol.* **40**: 128-136, 1950.

PERIODICAL ABSTRACTS

GENETICS

Homozygous hemoglobin C: a new hereditary hemolytic disease. D. W. Terry *et al. New England Journal of Medicine* **251** (1954), pp. 365–373.

Persons who inherit from both parents the abnormal blood protein known as hemoglobin C suffer with a mild anemia. This condition is much less common than the more severe sickle-cell anemia, but like the latter occurs almost exclusively in Negroes. The abnormal hemoglobin was first discovered in Negroes suffering from an anemia of intermediate severity, who were found to have inherited sickle-cell hemoglobin from one parent and hemoglobin C from the other. Analysis of family data indicates that the two genes which produce the respective hemoglobins represent mutations of the same normal gene. While sickle-cell hemoglobin can be identified by means of a simple test, hemoglobin C can be detected only by electrophoresis; anemia due to hemoglobin C closely resembles anemia of other, unrelated types.

The anemias are an outstanding example of how, in the future, science may be expected to analyze each of many diseases into multiple hereditary and non-hereditary types.

Muscular distrophy occurring in identical twins. A. G. Beckett. *British Medical Journal* **1** (1955), pp. 389–391.

The author describes a pair of 45-year-old identical twins in whom one had advanced muscular dystrophy and the other showed only early signs of the disease. There has long been confusion about the classification of this presumably hereditary condition, and no previous cases are known in adult identical twins. These twins showed primary involvement of the thigh muscles, extending finally, in one, to muscles of the face. The more severely affected twin noticed the onset of his symptoms at age 18, while his brother still considers himself healthy. The twins led very similar lives as farm laborers within a few miles of each other. The disabled twin had never married, while his brother was married and childless. There were no other cases of muscular dystrophy in the family. The twins had always been regarded as identical, and showed the requisite similarity in blood groups, fingerprints and measurements. It appears, therefore, that some environmental factor may determine at least the severity of this particular form of muscular dystrophy.

The effects of selection and domestication on man, L. H. Snyder. *Journal of the National Cancer Institute* **15** (1954), 759-769.

Civilization is essentially self-domestication. In addition to culture, it creates a protective environment that affords ever-increasing safety and security. Domestication is probably responsible for man's near-hairlessness and some other physical modifications of the usual mammalian traits, but greater changes are doubtless yet to come. Medical science is rendering many formerly "deleterious" mutations less harmful or quite innocuous, so that they may become more common or even "normal." But this process has its own limits short of utter genetic deterioration of the species. Some mutant genes may never be protected by medical science, and will be kept at a low frequency by natural selection. "And selection will again begin to operate against any gene for which it has been relaxed if the burden of providing the necessary therapeutic conditions begins to outweigh the social value of providing them."

Human behavior, determined more and more by the cerebral cortex, has been ever less subject to control by genetic mechanisms. In fact, the diversity of man's social environment requires a great plasticity in his responses, and this very plasticity has been built into his genetic constitution. The author is not impressed by the evidence for declining intelligence potentials, and regards man's biological constitution to be so stable that genetic changes need not be feared or hoped for. Any improvements to be made in ourselves must come from the better management of social relationships.

Treatment of phenylketonuria with a diet low in phenylalanine. L. I. Woolf *et al. British Medical Journal* 1955 **(1)**, pp. 57–64.

Phenylpyruvic mental deficiency is a hereditary disease in which the body is unable to utilize the amino-acid, phenylalanine, in the usual ways. Since the compound is present in nearly all proteins, affected individuals have a large excess of this and of related compounds in their blood and urine. On the supposition that mental deficiency in these individuals results from toxic effects of the phenylalanine, the authors devised an artificial diet containing little or none of the compound and fed it to three affected children for as long as 10 months. All three showed steadily increasing intelligence quotients after starting the diet; two who

were under three years of age improved from 20 to 30 and from 42 to 49, respectively. The third child was five years old at the time of the treatment and her IQ rose only from 11 to 14. At the observed rate of improvement, the first two children may attain educable levels before puberty.

The diet is almost entirely synthetic, and therefore expensive and troublesome, but if started in early infancy it may well offer such children the possibility of normal development.

Aniridia and oligophrenia, a hereditary syndrome, Hans Grebe. *Journal de Genétique Humaine* **3** (1954), pp. 269–283.

This new form of hereditary mental deficiency is characterized by congenital eye defects resulting in near blindness. The combination of defects is certainly rare, and the few cases previously noted have not been recognized as hereditary. This report describes a single family group in which short stature and curvature of the spine were also present in the affected individuals. Seven persons were affected in three generations and evidently transmitted the syndrome as a dominant disease. The visual defect could not be corrected with glasses and affected children did not progress in school beyond the fifth grade. The mental subnormality was out of proportion to the visual handicap in the cases examined. Four members of the family had been placed in institutions for mental defectives. Two other females married and raised five and two children, respectively, losing five others in infancy. In the sibship of five, all were defective except one male, and he was killed in the war.

A genetic study of progressive spinal muscular atrophy, N. C. Myrianthopoulos and I. A. Brown *American Journal of Human Genetics* **6** (1954), pp. 387–411.

Like many diseases of the nervous system, progressive spinal muscular atrophy usually begins after the reproductive period and is extremely variable in its manifestations. In some persons it may affect chiefly muscles of the extremities, in some, muscles of speaking, chewing and swallowing, and in others it may paralyze eye movements. Most cases seem to be isolated instances in otherwise normal families, but the great variability and late onset may result in "negative" family histories even for patients with several potentially affected relatives. In any event, there is no consistent clinical difference between the sporadic and the familial cases, which makes it possible that all instances have a common hereditary basis.

The incidence of the disease is relatively low, but the authors found 10 pedigrees previously described in medical literature. To these they added two more obtained from patients at the University of Minnesota Hospital. In all these pedigrees the inheritance is dominant, and in one of the Minnesota families a man and his wife were both affected together with six of their eight offspring. Four of these six are already grandparents with a total of 29 grandchildren.

As medicine lengthens man's life span, diseases with late onset will assume increasing medical importance. It is likely that the responsible genes are more widely distributed in the population than those for most hereditary diseases, because in our relatively short-lived ancestors these late diseases rarely interfered with family survival. Negative eugenics might be highly effective against diseases in this category if persons destined to become affected could be recognized early in the reproductive period.

A method of estimating the frequency of abnormal recessive genes in man, H. M. Slatis. *American Journal of Human Genetics* **6** (1954), pp. 412–418.

First-cousin marriages should be almost as useful as brother-sister or father-daughter matings for the recently suggested purpose of estimating the number of abnormal recessive genes in the average human. The author gives a table which shows the probability that a recessive gene shared by two parents will appear in their offspring, according to the number of children they have. One can apply this table to data on the frequency of defective children born in consanguineous marriages to estimate the number of recessive defective genes shared by the parents. In the case of first-cousin matings this will be one-eighth of the defective genes carried by each of the common grandparents.

The method is illustrated with data obtained on children seeking medical treatment, admittedly biased. In 17 sibships the average number of defective recessives shared by first-cousin parents was close to one, so that each common grandparent presumably had about eight such mutant genes. This coincides with the number calculated by Muller on theoretical grounds, although bias and other problems prevent an exact comparison.

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POPULATION

The population of the United States in 1950 classified by age, sex, and color—a revision of census figures. Ansley J. Coale. *Journal of the American Statistical Association* **50** (1955), pp. 16–54.

With the cooperation of the Census Bureau which supplied certain unpublished data necessary for this analysis, Coale provides a thorough, sophisticated, and convincing study of completeness of enumeration in the 1950 Census according to color, sex, and age. Two "internal" tests that were utilized were sex ratios and age ratios. (The latter is the ratio of the number of people in a given age group to half the number in the two adjacent age groups.)

Several "external" tests included (a) the use of registration data for checks on number of young persons; (b) previous censuses for checks on number of persons 10 years of age and over; (c) the selective-service draft registration figures for checks on number of males of given age groups; and (d) the results of the Census Bureau's Post Enumerative Survey of 1940.

Since the evidence indicated that recent censuses (1930, 1940 and 1950) were subject to similar patterns of errors, Coale used "the hypothesis of similar errors as a means for forming new estimates of overcounts and undercounts of the 1950 Census." The author lists as justification for "credence" in this hypothesis the following: (a) There was no substantial change in census procedures in the last three censuses; (b) there are striking similarities in the sex ratios by age and color and in the age ratios by sex and color; (c) omissions and misstatements seem to have been much the same in the three censuses, judging from the similar patterns of discrepancies.

Three different assumptions are made under each of which estimated errors are presented by color, age, and sex: (a) that the errors in 1930 equal the average of the 1940 and 1950 errors; (b) that the errors in 1930 equal those in 1940 or 1950, whichever is less; and (c) that the errors in 1940 equal those in 1950. In addition, a "more refined version of the hypothesis [of similar errors] would assume that the errors in one census were the same as in another after explicit allowance [is made] for observed changes in five-year age heaping. . . . This more refined hypothesis is used in preparing the figures we finally select as overestimates of the 1950 population."

The author summarizes his findings as follows:

"The corrections we have selected indicate that there were about 5 million persons more in the United States in 1950 than were counted by the census. The number of males was understated by about 3 million and the number of females by about 2 million. The white population was apparently subject to an undercount of nearly 2.5 per cent and the nonwhite population to an undercount between 12 and 13 per cent. The largest understatements of numbers were among young children, young adult males, and persons aged 55–59" (p. 44).

The author says: "It would be costly to extend the training of enumerators and only a moderate improvement would result (the meagerness of the improvement is implied by the small errors discovered by the Post Enumerative Survey)." He also states, however, that relatively inexpensive assessment of the completeness of the census enumeration has been facilitated by the development of nationwide vital statistics.

The present writer is constrained to make one personal observation. In connection with the stability of census procedures in 1930, 1940, and 1950 Coale says that there were "*some* procedural changes that may well have altered the pattern of errors somewhat." Among these were "the introduction of the special infant cards in 1940 . . . . the new rules in 1950 designating the college rather than the home as the usual residence of college students . . . . and the "T-Night" procedure in 1950," as a means of enumerating transients. The "T-Night" procedure had its counterpart in New York City, at least, in the U. S. Census of April 1930. The present writer, then enrolled as a student of vital statistics and population under the late Robert E. Chaddock at Columbia University, had the opportunity of participating in a "one-night" census of selected cheap lodging houses for transients in New York City.

Hauser, Philip M. (Editor): World Urbanism. A Symposium of Articles in *The American Journal of Sociology*, March, 1955, LX, No. 5, pp. 427-503. 427–503.

As the editor states in the foreword, "This issue does not pretend to deal comprehensively with the many aspects of world urbanism. It is designed rather to provide some relevant data, to pose some questions, and to point to new areas of urban research on a world-wide basis." The initial article by Kingsley Davis "The Origin and Growth of Urbanization in the World," emphasizes the relative recency of the large city. "The sites of the earliest 'cities' show that they were small affairs." He quotes Childe's statement that "Ur, with its canals, harbors, and temples, occupied some 220 acres" and Davis estimates that the city "could hardly have boasted more than 5,000 inhabitants."

An especially informative article in the series is Donald J. Bogue's "Urbanism in the United States, 1950." This paper draws upon some of the findings "of a long-range study of population distribution, the funds of which were granted by the Rockefeller Foundation. Detailed . . . . data will be found in [Bogue's] monograph, The People of the United States: Trends in Their Number, Distribution, and Characteristics."

The percentage of the population classified as "urban" has increased steadily since 1790 when it was only 5.1. The percentage was 59.0 under the "old" and 64.0 under the "new" urban definition in 1950. It was 56.5 under the "old" definition in 1940.

During 1940–1950 the absolute increase in the urban population of the United States was some 22.0 million. This is broken down according to components of growth as follows: Change in urban definition, 7.5 million; natural increase, 8.4 million; net migration, 3.9 million; and change in classification, 2.1 million. In terms of percentages the four components, respectively, accounted for 34, 38, 18, and 10 per cent of the increase.

The urban population of 1950 is compared with the rural nonfarm and rural-farm population with respect to selected characteristics. By sex, the proportion of females was highest (51.4%) in urban and lowest (47.6%) in the rural-farm population. The proportion of foreign-born whites was highest in urban areas (8.8%) as compared with 3.6 in rural nonfarm areas and 2.4 in rural-farm areas. By marital status, the urban population was in intermediate status with respect to proportions single and proportions married, but it ranked highest with respect to proportions widowed and divorced (11.5%) as compared with 9.6 and 6.7%, respectively, in the rural nonfarm and rural-farm populations. The educational attainment of population 25 years of age and over, as expected, was lowest in the rural-farm areas and highest in the urban areas.

The crude birth rates, fertility rates, and fertility ratios among both whites and nonwhites increased more rapidly in the urban than in the rural areas during 1940–1950. Nevertheless, the absolute levels in 1950 were consistently higher in the rural than in the urban areas.

A paper by Otis Dudley Duncan and Beverly Duncan, "Residential Distribution and Occupational Stratification" is based largely upon census tract data for Chicago and adjacent areas. Utilizing an *index of segregation*, an *index of low-rent concentration*, and an *index of centralization*, the authors report that their "ecological analysis has provided strong support for the proposition that spatial distances between occupation groups are closely related to their social distances, measured either in terms of conventional indicators of socio-economic status or in terms of differences in occupational origins; that the most segregated occupation groups are those at the extremes of the socio-economic scale; that concentration of residence in low-rent areas is inversely related to socio-economic status; and that centralization of residence is likewise inversely related to socio-economic status" (p. 502). However, a familiar type of exception plagues the authors as it has plagued other students of social stratification: "Clerical and kindred workers have substantially more education than craftsmen, foremen, and kindred workers, and the clerical occupations are usually considered of greater prestige than the craft and related occupations. However, craftsmen-foremen have considerably higher incomes on the average . . . . " (p. 502.)

Other papers in the symposium on world urbanization include: Gideon Sjoberg, "The Preindustrial City"; William Bascom, "Urbanization Among the Yoruba;" Norton S. Ginsburg, "The Great City in Southeast Asia;" and Robert I. Carne, "Urbanism in India."

The aging of populations and the prolongation of life (Le Vieillissement des populations et l'allongement de la vie). Alfred Sauvy. *Population* 9 (1954), pp. 675–682.

For some time the *Institut National D'Études Démographiques*, of which Dr. Sauvy is Director, has been much concerned with the problem of aging of the population. Beginning with the statement that aging of the population is most often defined and measured by the proportion of aged persons (persons 60 and over, for example) in the total population, Dr. Sauvy undertakes to demonstrate that aging of the population arises mainly from declining fertility and that only to a negligible extent is it directly attributable to declines in mortality.

Dr. Sauvy refers to a previous study of his colleague, Dr. Bourgeois-Pichat, in which the hypothetical age structure of France was computed under the dual assumptions of no decline in fertility since 1776 and the existing declines in mortality. The results indicated a virtual stability in the proportion of persons 65 years of age and over.

Other writers (Valaoras, Notestein, Kiser) have also adduced evidence that declining fertility plays a more decisive role than declining mortality in the aging of the population. Sauvy, however, takes a comparatively extreme view of the matter. At the other extreme, of course, are the people in medicine and public health who regard declines in mortality as the important underlying factor.

Diametrically opposite viewpoints reflect differences in definition. People in medicine and public health probably think of aging as rather synonymous with prolongation of life. The increase of

expectation of life and also the numerical increase in aged persons, of course, are results of past declines in mortality.

Dr. Sauvy explains that one reason why past declines in mortality have contributed little toward the increase in percentage of aged persons is that the declines in mortality have been strongest in youngest ages and weakest at oldest ages. He acknowledges that aging of the population would be accentuated in the future if cancer, heart disease, etc., were effectively attacked.

Some demographic characteristics of recently married persons: comparison of registration data and sample survey data. Hugh Carter, Paul C. Glick, and Sarah Lewit. *American Sociological Review* **20** (1955), pp. 165–172.

The registration of marriages and divorces has lagged behind that of births and deaths. The National Office of Vital Statistics is endeavoring to strengthen marriage and divorce statistics. At present the "NOVS collection system for marriage and divorce statistics is based primarily upon tabulations prepared in the vital statistics offices of 36 States with central files of marriage records and 30 States with central files of divorce records." The "registration data" referred to the title of this article, however, are restricted to those from 27 or fewer States. In fact, only 10 States are represented in *all* the tables presented in the paper.

The "sample survey data" were derived from the April, 1953 Current Population Survey of "about 25,000 households located in 68 scientifically selected areas in 42 States and the District of Columbia."

In the present article the authors weigh the registration data against the sample survey data partly for the purpose of detecting biases that may exist in each type of data, and partly to secure the best substantive data possible regarding characteristics of recently married persons.

The chief results may be summarized as follows: First marriages accounted for three-fourths to four-fifths of all the marriages during the Survey period (January, 1950–April, 1953). The proportion of first marriages was somewhat larger for whites than for nonwhites.

Of the remarriages, approximately one-quarter were of persons previously widowed and about three-quarters were of persons previously divorced.

The median age at first marriage was about 20 for brides and 23 for grooms. For remarried persons the median ages were 35 for brides and 40 for grooms. The medians given are those computed from NOVS data; the ages are slightly higher in the CPS data.

The ages at remarriage are 15–20 years lower for persons previously divorced than for those previously widowed. For women the median ages at remarriage are 31 years for the divorced and 47 for the widowed. Corresponding medians for men are 36 and 57 years. (p. 168).

The development and structure of Brazil's population. Giorgio Mortara. *Population Studies*, **8** (1954), pp. 121–139.

The author of this paper is now the president of the International Union for the Scientific Study of Population. This fact is mentioned because his life work as a demographer in Brazil has afforded a good example at once of gaining professional recognition and of supplying creditable studies of Brazil's population despite the inadequacy of demographic data in that country. "An almost insuperable obstacle to the studies on Brazilian demography is the incomplete registration of births and deaths and the negligence of registration officers, who often omit to notify the central statistical service."

During the century 1850–1950 Brazil's population increased at a slightly higher average rate than that of the United States. With about 55.8 million in 1953 Brazil has a larger population than any other country of Latin culture.

Because of past intermixtures "it is impossible to achieve a satisfactory ethnic classification of the Brazilians." (p. 123.) However, in the 1950 Census, 62 per cent were reported as "white," 27 per cent as "brown," 11 per cent as "black," and less than 1 per cent as "yellow." In the 1872 Census only 38 per cent were classified as "white."

Like Columbia, Peru, Venezuela, and Mexico, Brazil has "a high proportion of children and adolescents and a low proportion of old people." Over half of the males aged 10 and over are in agriculture. More than two-thirds of Brazil's population dwell in small rural centers; less than one-sixth live in cities of 100,000 population or over.

Mortara estimates that Brazil has a birth rate of about 42–44 per 1,000 population and a death rate of 18–20. Hence the crude rate of natural increase is in the order 22–26 per year.

Among demographers, Mortara is known especially for his contribution to the development of life tables for countries with inadequate vital statistics. According to his figures the expectation of life at birth was 39.3 for males and 45.5 for females in Brazil under mortality conditions of 1940–1950.

"The main flow of internal migration is directed towards the State of São Paulo, the Federal District and the State of Paraná. The States of Rio de Janeiro, Goiás, and some others also received large numbers of migrants. . . ." Immigration from other countries was of small magnitude during 1930–1950. It has recently become again a factor of importance in population growth. During the three years 1951–1953 some 227,000 immigrants arrived in Brazil. Of these, 100,000 came from Portugal (the cultural Motherland), 41,000 from Spain, and 40,000 from Italy.

CLYDE V. KISER
Milbank Memorial Fund

FIRST INTERNATIONAL CONGRESS OF HUMAN GENETICS

Including medical and clinical genetics

Copenhagen, August 1-6, 1956

PRELIMINARY PROGRAMME

The Secretariate of the First International Congress of Human Genetics:
The University Institute for Human Genetics
Tagensvej 14, Copenhagen N, Denmark

An international group of scientists within the field of Human and Medical Genetics has recommended that an International Congress of Human Genetics should be arranged in Copenhagen in 1956. Further they proposed an International Committee for the First International Congress of Human Genetics to be appointed and a permanent International Organization for Human Genetics to be established.

The first proposal concerning the Congress in Copenhagen was made by F. J. Kallmann, New York, M. Lamy, Paris, C. H. Alström, Stockholm, and this idea has later been supported by numerous human geneticists in many countries.

THE DANISH ORGANIZING COMMITTEE

has proposed the following provisional programme

All persons interested in the subject of Human Genetics and especially of Medical Genetics are entitled to be members of the Congress.

THE FIRST INTERNATIONAL CONGRESS OF HUMAN GENETICS

will include

Plenary Sessions.
General and Special Scientific Sessions.
Round-table Conferences.
Symposia (eventually).
Exhibitions.
Demonstrations.
Meetings of Special Committees.

The following is a provisional list concerning the subjects and the section of the Congress:

Methods in Medical Genetics.
Demography and Medical Statistics.
Genetics and Psychiatry, Psychology and Criminology.
Genetics and Mental Deficiency.
Genetics and Neurology.
Genetics and Internal Medicine.
Genetics and Surgery and Orthopaedics.
Genetics and Paediatrics.
Genetics and Cancer.
Genetics and Ophthalmology.
Genetics and Otolaryngology.
Genetics and Defects of Speech.
Genetics and Odontology.
Genetics and Intersexuality in Man.
Genetic Carriers in Man.
Human Biochemical Genetics.
Phenocopies in Man.

Genetic Hygiene and Genetic Counseling.
Genetics and Social Medicine.
Genetics of a Human Population including Mutation, Selection, Intermarriage, Isolates, Assortative Mating, Genetic Drift, etc.
Differential Fertility.
Anthropological Genetics including Problems of Parentage and Identification.
Somatology and Constitutional Types.
Twin Investigations.
Blood Groups and Immunogenetics in Man.
Crossing-over and Linkage in Man.
Quantitative and Multifactor Inheritance in Man.
Lethal Genes and Sex-linked Genes in Man.

Cytological and Radiation Genetics in Man.

Genetics and Experimental Pathology.

A definite list of the sections will be given in the final programme according to the subjects of the communications received.

The formal invitation to the Congress will appear with the final programme as soon as possible. The Congress and the provisional programme are strongly recommended and supported by the Danish Organizing Committee.

THE DANISH ORGANIZING COMMITTEE

The members of this Committee are

Johannes Frandsen, M.D., Director of The Health Service of Denmark, Copenhagen.

Oluf Andersen, M.D., Professor of Paediatrics, Queen Louise's Children's Hospital, Copenhagen.

Erik Bartels, M.D., Chief Physician, Copenhagen County Hospital, Gentofte.

Arne Björk, Odont. Dr., Professor of Orthodontics, Royal Dental College, Copenhagen.

Sven Brandt, M.D., Assistant Professor of Paediatric Neurology, Queen Louise's Children' Hospital, Copenhagen.

Georg V. Bredmose, M.D., Medical Superintendent, The Andersvaenge Institution for Mental Defectives, Slagelse.

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Øjvind Winge, Ph.D., Professor of Genetics, The Carlsberg Laboratory, Copenhagen.

CHAIRMAN OF THE DANISH ORGANIZING COMMITTEE

Tage Kemp, M.D., Professor of Human Genetics, The University Institute for Human Genetics, Copenhagen.

PLAN TO ATTEND

THE

Eighth Annual Meeting

OF THE

AMERICAN SOCIETY OF HUMAN GENETICS

The meeting will be held at Michigan State College, East Lansing, Michigan, September 6-8, 1955. It will be a part of the annual program sponsored by the American Institute of Biological Sciences.

THE AMERICAN JOURNAL OF HUMAN GENETICS

A quarterly record of research, review and bibliographic material relating to heredity in man, published by THE AMERICAN SOCIETY OF HUMAN GENETICS.

Editor: LAURENCE H. SNYDER, The Graduate College
University of Oklahoma, Norman, Oklahoma

The editor and his staff of associates will be glad to consider manuscripts pertaining to human genetics.

Subscription to THE AMERICAN JOURNAL OF HUMAN GENETICS or information pertaining to subscription should be addressed to the Treasurer of the Society, Dr. Walter E. Heston, National Cancer Institute, Bethesda 14, Maryland. The subscription price per volume is $8.00. A volume consists of 4 numbers. Single numbers cost $2.50. The first volume was published in 1949. One volume has been published each year since then.

Correspondence pertaining to membership in THE AMERICAN SOCIETY OF HUMAN GENETICS or to general society affairs should be addressed to the Secretary of the Society, Dr. David C. Rife, Department of Zoology, The Ohio State University, Columbus, Ohio.

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